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# APPENDICAL INTUSSUSCEPTION

## A CASE IN AN ADULT

BY WILLIAM L. WALLACE, M. D., SYRACUSE, NEW YORK

BEFORE considering the following very rare and interesting case of appendical intussusception, it will be well to remember that in the ileocæcal and ileocolic varieties, the appendix is simply dragged along with the cæcum, and will be found located, with the mesentery of the ileum, between the two inner layers of the intussusception. If the ileocæcal valve presents at the anus, the opening into the base of the appendix may sometimes be seen. If the intussusceptum, composed of the two inner layers of the intussusception, should slough at the neck, of course the appendix would be thrown off with the cæcum. These cases are not to be counted as appendical, unless in the future, the appendix can be shown to have something to do with the formation of the intussusception.

The term "appendical intussusception" is used when the appendix is turned wrong side out into the cæcum. This may result in one of the following conditions which may be found at operation or autopsy:

1. The appendix may be partly or completely inverted.

2. The process may continue and the cæcum may also become inverted; the ileum may be dragged along and the partly or completely inverted appendix may become the apex of a long intussusception extending even to the anus.

In these advanced cases:

(*a*) If the appendix is completely inverted, or turned wrong side out, its tip will be the apex of the intussusception.

(*b*) If the appendix is partly inverted, the end which is not inverted may be tightly grasped by the inverted cæcum. Here the appendix is partly inverted and partly invaginated, and the long intussusception can be easily reduced to this place. Then we shall see the *tip* of the invaginated appendix projecting from the pit in the end of the inverted cæcum; and if we cut open the cæcum we shall see the inverted *base* of the appendix projecting into the colon (Fig. 1).

Appendical intussusception may start in two ways:

1. The base of the appendix may be gradually inverted into the cæcum perhaps in an effort to expel a concretion. This causes a protrusion in the inside of the gut which acts as a polypus, setting up the violent expulsive effort, or overstretching the surrounding cæcum and producing the paralysis, which results in an intussusception.

2. The intussusception may start at the cæcum which may be inverted into the colon. This will invaginate the appendix which may be treated by the cæcum as a foreign body to be expelled by partial or complete inversion.

CASE. Mr. J. L. S., aged 54, laborer in a wagon shop, personal and family history good, except his father died of cancer of the face; was sent into the hospital of the Good Shepherd, Syracuse, N. Y., January 31, 1910, to have his appendix removed. He had had his first attack of lower right abdominal inflammation in October, 1909, lasting three days and occurring after an unreasonably hearty, indigestible meal. One month

later he had a second attack lasting a week, much harder than the first, with severe pain and tympany.

The present or third attack commenced suddenly December 23, 1909, five weeks before coming to the hospital, with very severe pain and rapid distension. A bunch which would raise up when he had pain, was soon noticed in the right side. Each pain was hard, lasting two to four minutes, recurring with short intermissions, often waking him up in the night. These attacks of pain had been frequent for five weeks, the last severe attack beginning four days before coming to hospital, and lasting two days. He had been very constipated during his attacks, but had never had vomiting, tenesmus, piles, or blood in his stools.

*Examination.* January 31, 1910. Temperature, 99; pulse, 88; white blood count, 10,200, 86 per cent polynuclears. Urine, 1021, no albumen, sugar, casts, blood or pus. Abdomen not rigid or distended. A bunch which seemed about the size of a lemon was evident in the right inguinal and lumbar regions about one inch internal to the anterior superior spine of the ilium, movable back and forth and not very tender. This mass seemed probably a growth in the cæcal region, possibly an inflammatory mass from an old appendicitis.

February 1, 1910, I opened the abdomen externally to the right rectus and found an intussusception in the ileocæcal region extending to the middle of the transverse colon, dragging in the cæcum and ileum. There was no strangulation of the large or small bowel and there were no adhesions. The ileum was easily squeezed back out of the colon, leaving the much thickened and inflamed cæcum tightly inverted into the colon, with the appendix buried in the pit at the end of the cæcum. The colon was contracted on the cæcum and the cæcum on the appendix. I could not withdraw the appendix from the cæcum and had to cut out the end of the cæcum with the appendix. Then it was seen that there was a mass within. This was the base of the appendix inverted into the cæcum. The piece of cæcum, therefore, that I cut out around the appendix formed a collar, distally to which was a large inflamed appendix invaginated into the inverted cæcum, and proximally to which was a large, black, almost gangrenous inversion of the base of the appendix into the cæcum (see plate). The appendix did not lie loosely as in a bag, but both the inverted and invaginated portions were tightly grasped. The mesentery of the appendix was very narrow and not badly damaged. The cæcum and ascending colon had a very long mesentery and were very movable. I sewed up the end of the cæcum and anchored it to the right iliac fossa and closed without a drain.

The patient recovered satisfactorily and has remained well. The pathological report of Professor Steensland, of the Syracuse University Medical College, showed that the thickening of the cæcum was chronic inflammatory, with no evidence of malignancy.

It will be noticed that this case did not have tenesmus or bloody stools, and I am convinced that many lives are lost by waiting for these

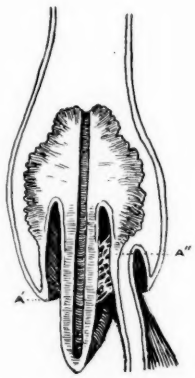


Fig. 1. Intussusception reduced as far as cæcum. Showing appendix inverted and invaginated. Appendix as shown in plates is removed at A'-A''.

classical symptoms, which are absent in about 25 per cent of all cases.

Appendical intussusception may cause obstruction of the bowels:

1. By peritonitis and strangulation, if the appendix is sufficiently pinched to become inflamed and gangrenous.

2. By mechanically blocking or pushing shut the ileocæcal valve.

3. By starting a long intussusception which fills the colon.

I find that more than one-half of all the cases of intussusception occur in infancy before the age of one year, and most of the rest before the age of four, and very few after fourteen. In adults, any kind of intussusception is very rare, usually chronic in character, occurring in the colon, often at the site of a carcinoma.

Appendical intussusception is very unusual at any age. The cases I find reported are as follows:

(1) Appendix inverted, four cases, all children.

(2) Appendix and cæcum inverted, one case, a child.

(3) Appendix partially inverted, proximal end containing a concretion projecting into the cæcum, one case, woman, aged 32.

(4) Appendix inverted, forming the apex of a long intussusception, four cases; one woman aged forty, and three children.

(5) Appendix partially inverted and forming the apex of a long intussusception, seven cases, six children, and the author's case, adult.

Total, seventeen cases, fourteen children, three adults.

Intussusception is one of the surgical conditions about which there is very much to learn. Most of the collections of statistics were made before the days of modern surgery. All authorities are agreed that most cases start in the vicinity of the ileocæcal valve. It has been sometimes taken for granted that the ileocæcal valve is in advance because an opening at the apex of the intussusception has appeared like the ileocæcal orifice, it being forgotten that the opening into the apex of any intussusception would appear like the ileocæcal opening. Corner believes that many of these cases are not classified correctly, that the apex is formed by the lower ileum or the cæcum and not by the ileocæcal valve.

It may, in the future, be shown that many intussusceptions now classed as ileocæcal are cæcal or appendical.[1]

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# ON THE DIAGNOSTIC POSSIBILITIES OF SKIAGRAPHY OF THE VAS DEFERENS, WITH OR WITHOUT SKIAGRAPHY OF THE URETER

## A Preliminary Report

By LOUIS E. SCHMIDT, M. Sc., M. D., and HERMAN L. KRETSCHMER, M. D., Chicago, Illinois

DURING some recent work on the topography of the kidney and ureter carried out by means of fuse wire catheters and the X-ray, the possibility occurred to us of applying the same general principles to determine the course of the vas deferens, particularly its course in the pelvis and its relations to the ureter.

Not infrequently shadows are noted in the pelvis which still remain unaccounted for by any of the shadowgraphic methods in use at the present time. It has appeared to us that by making this additional catheterization of the vas deferens some facts might be elicited which heretofore have remained unexplained. It is also a well-established fact that some X-ray pictures taken with a fuse wire catheter in the ureter show that many of these pelvic shadows have no connection whatever with the ureter. By catheterizing the vasæ with fuse wire and then taking an X-ray picture with the wire in situ, it occurred to us that it might be possible to show whether any shadows present are in direct connection or not with the vas.

Concretions having been known to occur in the ampulla, as well as in the seminal vesicles; our work in this field has lead us to use cargentos, argyrol, and other newer silver salts which have been in use for diagnostic work on the pelvis of the kidney and the ureter. Up to the present time this has not given very satisfactory results, but in view of the fact that this is a preliminary report of our fuse wire work on the vas, we will omit the work carried out with the newer silver salts on the vas and seminal vesicle. The negatives made with the newer silver salts have not given as much information as was obtained from the negatives made with fuse wire; we will, therefore, proceed to give in detail our results with fuse wire.

The illustrations in any of the well-known text-books or atlases on anatomy represent cadaver work; while on the other hand, the pictures presented below represent conditions in the living subject. Given a pelvic shadow

[1] For records of cases, see: Corner, Eldred M., Annals of Surgery, November, 1903, also Kelly and Hurdon, The Vermiform Appendix and Its Diseases, p. 464, Saunders, 1905.

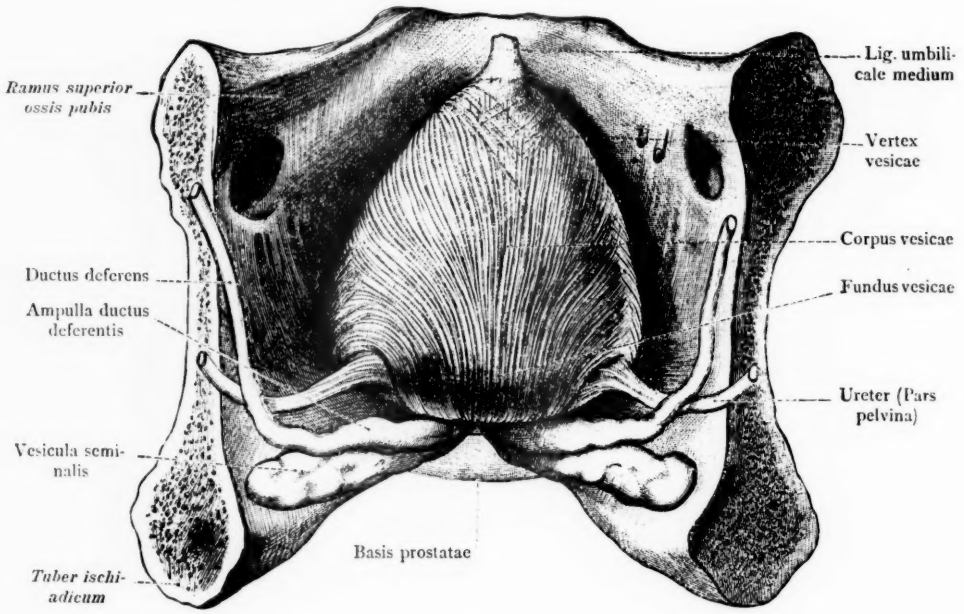


Fig. 1.

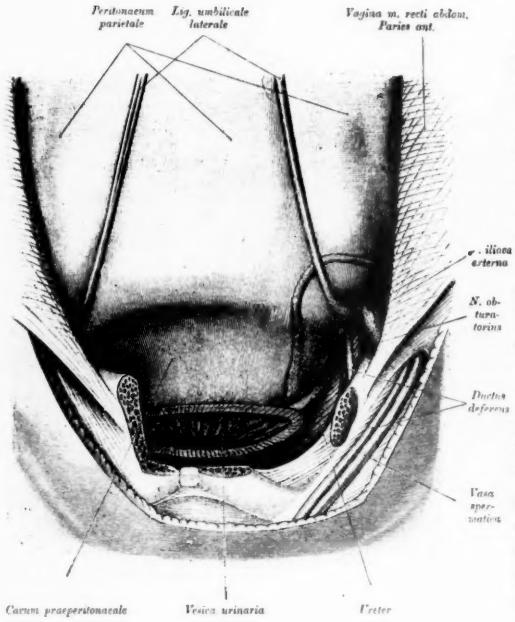


Fig. 2.

in a case for diagnosis, it is quite difficult to determine accurately the anatomical position by comparing the X-ray plate with an anatomical illustration. By the above-mentioned method we believe that some information can be obtained in certain obscure cases and, we take the liberty of suggesting this method, so that it may be used in those cases in which these facts must be taken into consideration.

Fig. 1, taken from Zuckerkandl's atlas, presents a forward view, and Fig. 2, taken from Toldt's atlas, presents a general view of the course and relations of both the vas and the ureter.

A few words in regard to the technique employed may not be out of place. Vasostomy was performed under local anæsthesia. In the group of cases in which this method was combined with skiagraphy of the ureters, it was our custom to do the ureteral work first; i. e., to catheterize the ureters with fuse wire catheters before carrying out the vasostomy. (In those cases in which cargentos was used, it was first injected into the ureters.) For the

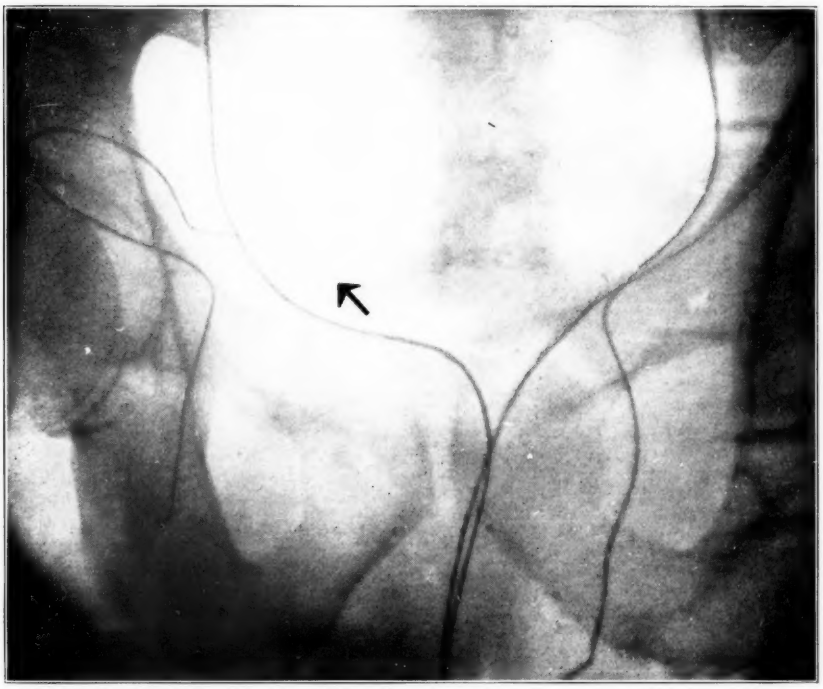

Fig. 3.

purpose of demonstrating the course of the vas, a very fine grade of fuse wire (1 ampere) was used. The wire was sterilized in 95 per cent carbolic acid, then in alcohol, and wiped dry with a piece of sterile gauze and lubricated with sterile olive oil before passing it into the vas. After having passed the wire as far as possible, the patient was exposed to the X-ray. In all pictures taken in this series the patients were in the prone position, and all deductions must be made bearing this fact in mind.

We wish to report briefly two cases in which the combined method was used and three cases in which only skiagraphy of the vas was employed.

Fig. 3. The course of both ureters is plainly demonstrated by the shadowgraph catheters. The wire in the right vas can be seen passing upward a short distance, then turning outward rather abruptly for a short distance, and after describing a more or less circular course, passes inward and downward, *crossing the ureter* and continuing a short distance beyond the ureter; while on the left side the course of the vas is upward and outward, and for some reason it fails to pass inward toward the median line, and does not cross the ureter as did the vas on the other side.

This patient had been operated upon for an enlarged prostate gland. On account of a persistent seminal vesiculitis it was decided to drain the seminal vesicles by means of a vasostomy. It was during this time, while the vasæ were open, that we decided to skiagraph the vasæ. On account of the pus in his urine, for the purpose of determining its origin, and to exclude the possibility of its being due to stone in the upper urinary tract, it was thought advisable to have the upper urinary tract exposed to the X-ray with fuse wire catheters in situ.

Fig. 4. The loop seen in the right catheter is due, not to any abnormality in the course of the ureter, but to a loop of the catheter in the bladder. The course of the vasæ on both sides is about the same up to the point of the first crossing of the vas and the ureter. On the right side the shadow of the wire in the vas apparently crosses the ureter three times, while on the left side it

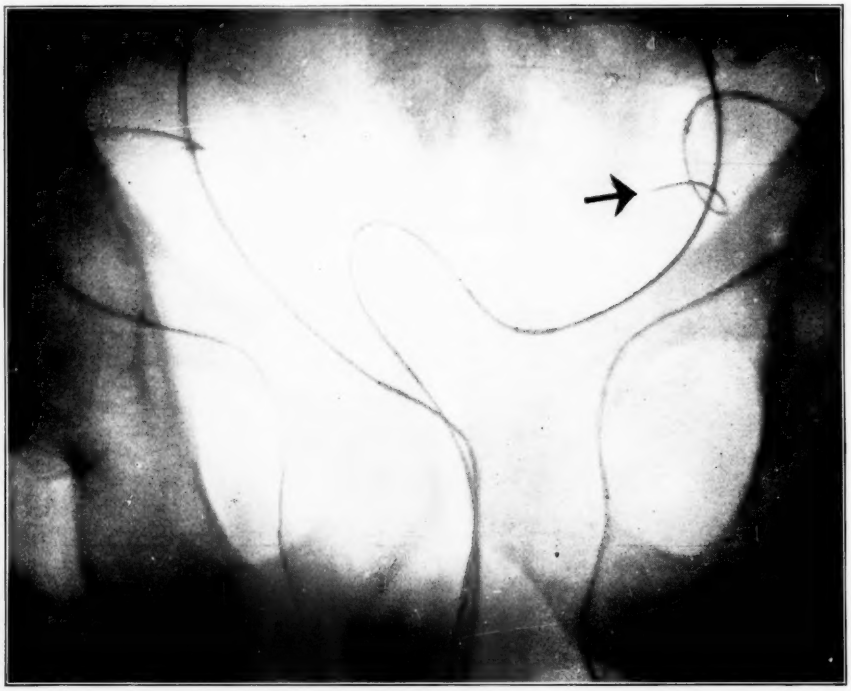

Fig. 4

appears as though the wire is bent on itself after it has crossed the ureter, thereby forming an acute angle.

If we now take the second group of pictures under consideration, Fig. 7 shows a similar loop formation occurring in the course of the vas as was noted in Fig. 4. We are inclined to believe that this loop formation is an artefact and not representative of the natural course of the vas, being produced in the following manner: If after having introduced the fuse wire as far into the vas as it will go, one continues to pass more wire into the vas, the vas simply forms a loop or two, depending upon the amount of force used in passing the wire.

Fig. 5. In this case fuse wire was passed into both vasæ. In the right vas the wire met an obstruction after having been passed only a comparatively short distance, whereas on the left side the wire passed somewhat farther, so that the end of the wire can be seen in the pelvis. (The arrows show the ends of the wires.)

Fig. 6. In this case the wire passes higher up than in the preceding case, and after making a short curve inward, terminates at a point that corresponds on the plate with the spine of the ischium.

The last three cases were patients suffering from gonorrhœal epididymitis, in whom vasostomy was performed for the relief of the gonorrhœal infection as recommended by Belfield, of Chicago.

From the pictures presented above, it can be stated in a general way that the vas takes a variable course. The greatest length of wire introduced has been five inches and the shortest two and one-half inches, measured from the external ring. In some instances in which the wire could only be passed for an inch or two, we were able to introduce a strand of silk worm gut at least twice as far, and we were also able to inject argyrol into the urethra, so that the patient passed the argyrol, mixed with urine, at the next urination. These two facts exclude

Fig. 5.

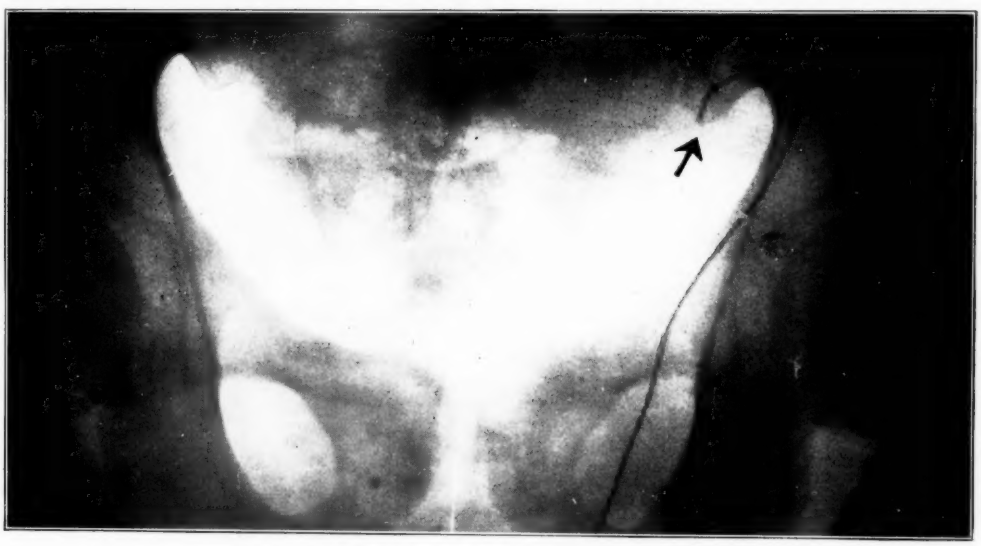

Fig. 6.

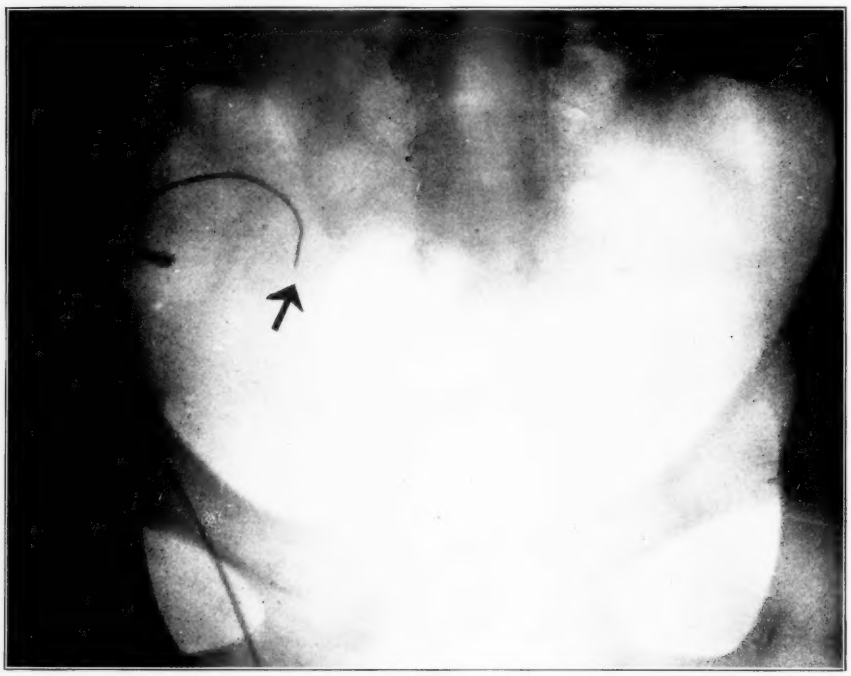

Fig. 7.

the possibility of a complete closure of the vas, which conclusion might have been reached if only the wire had been used.

There can be no objection to the ureteral catheterization in this work, since all the possible objections have been discussed elsewhere; but on the other hand, there may be objections raised to the performance of vasostomy, as it has not been positively established that closure will not result. Should this occur, a resection of the stenosed part of the vas and an anastomosis might overcome the objection.

Naturally, a stricture of the vas would make it impossible to carry out this procedure.

At the present time we are not in a position to state that the findings gained by this method, either with or without ureteral catheterization, warrant its use as a method of examination; yet we are inclined to believe that instances may arise in which it might be of value in establishing a correct diagnosis.

In summing up the value and the possibilities of this procedure we are inclined to believe that (1) it gives positive information in regard to the crossing point of the vas and the ureter; (2) that it will aid in establishing whether the shadows seen in X-ray pictures of the pelvis are in direct connection or not with the vas deferens; (3) knowing the exact course of the ureters and the vasæ, it gives us a better idea as to the probable location of the seminal vesicles, so that any shadows that may appear in a skiagraph can be more carefully considered from their point of origin in relationship to the seminal vesicles.

We wish to take this opportunity of thanking Brother Ignatius Schneider, radiographer to the Alexian Brothers' Hospital, for the X-ray work which has been carried out in connection with these cases.

# A CONTRIBUTION TO THE SURGERY OF THE ŒSOPHAGUS

## With the Report of Five Cases of Cicatricial Strictures Treated by Cutting Through the Œsophagoscope

By WILLIAM LERCHE, M. D., St. Paul, Minnesota

ANATOMY, minute and gross. The wall of the œsophagus is from 3.5 to 4 mm. in thickness, and consists of four coats — the mucosa, the submucosa, the muscular coat, and the outer tunica adventitia. The mucosa is about 0.8 to 1 mm. thick, and is made up of stratified squamous epithelium, the tunica propria beset with papillæ, and the muscularis mucosa of non-striated muscle fibers placed longitudinally. The epithelial lining at birth has, according to Schridde (1), from 9 to 10 layers of cells gradually increasing to an average of 24 layers in adults (may have as many as 32). Outside the mucosa is a layer of somewhat loosely joined bundles of connective tissue with elastic fibers constituting the submucosa. The muscular coat is from 0.5 to 2.2 mm. thick and arranged in two strata, an inner circular and an outer longitudinal.

The fibers of the inner stratum are rarely circular, but are elliptically or obliquely placed, and some fibers in the lower part run in a screw shaped manner (Laimer). The arrangement of the longitudinal fibers, in the upper end of the posterior wall of the œsophagus, is such that they leave a small triangular space uncovered. Although covered by the circular fibers and the other coats, anatomists describe it as a weak spot.

The longitudinal muscular layer predominates in the upper fourth of the œsophagus, but below the circular layer becomes thicker, and in the lower fourth it is three times as thick as the longitudinal, particularly towards the cardia. In the upper fourth most of the muscular fibers are of the striated variety, but below the non-striated fibers are almost exclusively found, although even near the cardia a few striated fibers may be seen. Accessory muscular fibers to the longitudinal layer are described, namely, the tracheal, the bronchial, the pleural, the aortic, and the phrenic. Surrounding the muscular coat is the tunica propria composed of dense connective tissue with elastic fibers.

Typical mucous glands are found, particularly in the upper half of the œsophagus and near the cardia. They originate in the submucosa and their ducts open between the papillæ.

Besides these Schaffer (2) has described another kind of glands grouped laterally in the upper end of the œsophagus. They are situated in the tunica propria and their ducts open through the papillæ. Similar glands are found in the lower end near the cardia, and occasionally in the middle of the tube. They are of the same type as the cardiac glands of the stomach, and called by Schaffer the upper and lower cardiac glands of the œsophagus. Schaffer thinks these of importance in studying the pathologic conditions of the œsophagus, because, where there are large clusters of these glands, the epithelial lining in this area will only consist of one single layer of cylindrical epithelial cells, while the surrounding parts have 24 layers of squamous cells, hence a locus minoris resistentiæ.

Schridde (3) found in two cadavers acid maceration of the upper cardiac cells, identical with the condition frequently found post-mortem in the stomach caused by the acid cells. These glands are absent in 30 per cent of bodies examined Stohr (4).

*Arteries.* The œsophagus receives its blood supply through the inferior thyroid artery, the posterior bronchial and the aortic branches, also branches from the gastric artery.

*Veins.* The blood is returned through the inferior phrenic veins into the inferior vena cava, others into the venæ azygos major and minor, and directly into the vena cava superior. Venous branches of the lower end communicate with the portal vein by way of the gastric vein, which may be of importance in establishing a collateral circulation.

*Nerves.* The innervation of the œsophagus is by the pneumogastric, which in the thoracic part forms a plexus in front of the organ. Sympathetic nerves join the pneumogastric branches (Krauss).

Von Openchowsky (5) demonstrated a "nervus dilatator cardiæ" formed by the union of strands from both vagi in the lower portion of the œsophagus, and also clusters of ganglion cells in the serosa of the cardia which have to do with the function of dilatation.

*Lymphatics.* These take origin from two networks, one submucous and the other muscular. The mucous network at its upper part is relatively independent of the homologous network of the pharynx. The collecting trunks from the cervical portion terminate in the internal group of the substernomastoid glands and in the glands of the recurrent chain. The latter comprises 3 to 6 minute glands situated on the lateral parts of the œsophagus and trachea along the recurrent laryngeal nerve. The efferent vessels of this chain terminate in the inferior glands of the sternomastoid chain or in the supraclavicular glands. The collecting trunks from the thoracic portion empty themselves into the periœsophageal glands in the posterior mediastinum. There is a true continuity between the gastric lymphatic network and that of the abdominal portion of the œsophagus (Poirier and Cuneo).

There is no distinct line to indicate the upper limit of the œsophagus, and for that reason authors have varied in their description, some placing it at the upper and others at the lower border of the cricoid cartilage. Lauteschlager and Schaffer, on histologic basis, place the commencement in the region of the

posterior surface of the plate of the cricoid cartilage, neither at the upper nor the lower border of the same. Anteriorly the longitudinal muscle fibers of the œsophagus are attached to the median ridge of the posterior surface of the cricoid.

For practical purposes I have here considered the œsophagus as beginning at the lower border of the cricoid cartilage. The lower end of the œsophagus is more distinctly marked by a rough zigzag line at the junction of the pale pink œsophageal mucosa with the deep red mucous membrane of the stomach, indicating the anatomical cardia.

The position of the cricoid cartilage, and consequently that of the œsophagus changes somewhat according to age, thus in the new born it may be found between the 3d and 4th cervical vertebræ, while in the very old it may be found near the entrance to the thorax [Alterssenkung of Mehnert (6)], the average position in adults being about the 6th cervical vertebra.

The cardia will be found in a corresponding position, in the new born as high as the 8th dorsal, and in the very old as low as the 12th dorsal, the average being between the 9th and 11th.

The cricoid cartilage also changes position with the extension and flexion of the head, its range of mobility in the long axis of the body being 4 cm., and in this the œsophagus takes part.

Morosow found that by loading the stomach the cardial as well as the upper end of the œsophagus, would sink considerably, showing that the organ is not so firmly fixed.

The œsophagus throughout its course in the neck and the thorax is surrounded by loose connective tissue. It is almost a straight tube and pursues a course from about the middle line above, passing through the diaphragm 2 to 3 cm. to the left of the middle line, joining the stomach 2 to 4 cm. below the diaphragm.

When there are abnormal curvatures of the spinal column there may be corresponding curvatures of the œsophagus. In case of anterior curvature of the spinal column it may be necessary to push the tracheal bifurcation forward with the œsophagoscopic tube in order to see the epicardia. In some individuals, with apparently normal spinal columns there may be lateral curvature of the œsophagus, likely depending upon the arrangement of the thoracic viscera.

I have repeatedly examined cases with the œsophagoscope, in which I was able to see from the upper end of the thoracic portion of the œsophagus to the epicardia and in which none of the curves described in the text-books of anatomy were seen, and this corresponds to the observations of Mikulicz. Mehnert ascribes these curves to post-mortem changes, caused by the relaxation of the suspension apparatus about the cricoid cartilage, and the diaphragm with the lower end of the œsophagus being pushed upward by the gas distended bowels, bringing the two ends closer together. The œsophagus rests upon the vertebral column behind and has the trachea in front. The thyroid gland approaches it laterally in the neck. In the chest cavity it comes in contact with the arch of the aorta and the descending aorta; the pericardium covering the left auricle; the left bronchus at the bifurcation and the bronchial lymphatic glands in the latter locality.

The length of the œsophagus varies according to the body length and the sex. Von Hacker (7) found in 38 male bodies the following measurements:

| Body length | Length of œsophagus |
|---|---|
| 156 to 160 cm. | 23 to 26 cm. |
| 160 to 170 cm. | 21 to 27 cm. |
| 170 to 176 cm. | 22 to 30 cm. |

Average length 24.9 cm. The most frequent measurements were 24 and 25 cm.

In 22 women:

| Body length | Length of œsophagus |
|---|---|
| 148 to 150 cm. | 20 to 24.5 cm. |
| 150 to 160 cm. | 21 to 27 cm. |
| 160 to 166 cm. | 21 to 25 cm. |

Average 23.3 cm. Most frequent measurements 23 and 24 cm.

Luschka and Schmauser, according to Kraus (8) found respectively 28 cm. and 35 cm. to be the average, but 35 cm. seem to be a rather high average, and in the following 25 cm. is taken as the average length of the adult male œsophagus; that of the adult female is somewhat shorter.

TABLE I

| | Men Body Length 150 to 177 cm. | | Women Body Length 142 to 167 cm. | |
|---|---|---|---|---|
| | Variations, cm. | Average, cm. | Variations, cm. | Average, cm. |
| Total length of the œsophagus | 23 to 30 | 25 | 20 to 26 | 23.2 |
| Distance from lower border of cricoid cartilage to the tracheal bifurcation | 9 to 13 | 10.4 | 8.5 to 13 | 10.1 |
| *a.* Cervical part, cricoid cartilage to manubrium sterni | 4.7 to 7.5 | 5.5 | 4 to 7 | 5.4 |
| *b.* Upper thoracic, from manubrium sterni to bifurcation | 4 to 8 | 4.0 | 3 to 6 | 4.6 |
| The lower thoracic part (bifurcation to cardia) | 12 to 17 | 14.6 | 11 to 15 | 13.2 |

TABLE II

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | Variations, cm. | Average, cm. | Most Frequent Findings, cm. | Variations, cm. | Average, cm. | Most Frequent Findings, cm. |
| Distance from the incisor teeth to the beginning of the œsophagus | 14 to 16 | 14.9 | 15 | 12 to 15 | 13.9 | 14 |
| Distance from the incisor teeth to the bifurcation | 23 to 29 | 26 | 26 | 22 to 27 | 23.9 | 24 |
| Distance from the incisor teeth to the cardia | 36 to 50 | 39.9 | 40 and 41 | 32 to 41 | 37.3 | 38 and 39 |

The distance from the incisor teeth to the beginning of œsophagus, i. e., the lower border of the cricoid cartilage, is 15 cm. (average 14.9 cm.).

For convenience sake in describing the seat of the strictures, the œsophagus is divided into the cervical part, the upper thoracic part, including the part at the level of the tracheal bifurcation, and the lower thoracic part, including the lower end.

In new born children the middle of the œsophagus corresponds approximately to the tracheal bifurcation.

In adults about two-fifths of the œsophagus are above the bifurcation and three-fifths are below.

The length of the cervical part is 5.5 cm., the thoracic part 18 cm. (variations of the latter from 2 to 4 cm.).

There is considerable difference in the diameters of the œsophagus, at the different levels, as given by the various authors.

Mehnert (6) agrees with Joessel, Velpeau, and von Hacker in that the œsophagus increases in width from above downward in the largest percentage of bodies. The same diameter is very rarely maintained throughout the entire length of the organ. In more than 50 per cent of bodies there are found constrictions (physiological) at certain levels of the œsophagus.

TABLE III

| Age | Dist. from Incisor Teeth: To the Lower Border of the Cricoid Cartilage, cm. | Dist. from Incisor Teeth: To Bifurcation, cm. | Dist. from Incisor Teeth: To Cardia, cm. | Total Length of the Œsophagus, cm. | Distance from Cricoid Cartilage to Bifurcation, cm. | Length of the Lower Thoracic Part Bifurc. cardia, cm. |
|---|---|---|---|---|---|---|
| 9 days | 7 | 12 | 17 | 10 | 5 | 5 |
| 3½ mos | 8 | 13 | 20 | 12 | 5 | 7 |
| 14 mos | 10 | 14 | 22 | 12 | 4 | 8 |
| 21 mos | 10 | 15 | 23 | 13 | 5 | 8 |
| 2 yrs | 10 | 15 | 23 | 13.5 | 5 | 8.5 |
| 3 yrs | 10 | 15 | 23 | 14 | 6 | 8 |
| 4 yrs | 10 | 15 | 23 | 15 | 6 | 9 |
| 5 yrs | 10 | 17 | 26 | 16 | 7 | 9 |
| 6 yrs | 11 | 19 | 28 | 17 | 8 | 9 |
| 9 yrs | 11 | 19 | 28 | 16 | 7 | 9 |
| 11 yrs | 18 | 18 | 28 | 18 | 8 | 10 |
| 12 yrs | 10 | 18 | 28 | 18 | 8 | 10 |
| 14 yrs | 11 | 19 | 31 | 20 | 8 | 12 |
| 15 yrs | 14 | 23 | 33 | 19 | 9 | 10 |

Those most constantly present are, at the level of the bifurcation of the trachea or somewhat above, at beginning of the organ or closely below, and on a level with the hiatus œsophageus; but one or more of these may be absent. Thirteen of these physiologic constrictions have been described, and according to Mehnert they correspond to the segments of the primary foregut from which the œsophagus is derived.

Von Hacker's measurements of the width of the œsophagus, in 40 bodies (by splitting

the posterior wall and measuring the mucosa) are as follows:

| | |
|---|---|
| At the lower border of the cricoid cartilage, diameter | 13 mm. |
| At the level of the bifurcation of the trachea | 13 mm. |
| At the hiatus œsophageus | 15.5 mm. |
| At the cardia | 22 mm. |

When a physiologic constriction was found in the lower thoracic part (usually 1 to 2 cm. above the diaphragm) the diameter of this was 14.8 mm.

Measurements on bodies in which he filled the œsophagus with plaster of Paris or wax show considerably higher figures:

| | |
|---|---|
| At the lower border of the cricoid cartilage, diameter | 16 mm. |
| At the bifurcation | 18 mm. |
| At the level of the diaphragm | 24 mm. |
| At the cardia | 35 mm. |

When a physiologic constriction was found (1 to 2 cm. above the diaphragm) the average diameter of this was 19 cm. The widest part between the constrictions is mostly found between the level of the bifurcation and the diaphragm with an average width of 20 cm.

*Pathology.* After exposure to the corrosive poison the affected part becomes necrosed and sloughs off, and in the process of repair by granulation, which follows, contraction takes place. The length of the time of exposure, the degree of concentration, as well as the quantity of the corrosive agent will determine the extent and depth of the necrosis, although the suppuration following the necrosis may undermine the mucosa beyond the area primarily affected by the poison and increase the extent of the stricture.

The necrosis may only involve the mucosa or perhaps the submucosa and form a superficial stricture as represented by the cervical strictures in cases 1 and 3, which were like rather thin diaphragms. It may be difficult to find the opening through this form of stricture, but once entered they yield readily to treatment.

When the muscular coats are invaded the resulting stricture becomes more dense and unyielding. The entire thickness of the œsophageal wall may participate in the scar formation and even the periœsophageal tissue. When the latter is involved the shrinking of this tissue is liable to cause kinking and twisting of the tube.

The form of the stricture may be linear, valvular, annular, or tubular. Above a tight stricture, particularly in the lower part, dilatation of the organ takes place, which was quite pronounced in case 2, but particularly in case 5.

Case 5 was obliged to gulp up a quantity of thick mucus, retained in the dilated part, before he could swallow anything. The wall of this part becomes hypertrophied, especially so the circular muscle fibers. The stagnation of food in the dilated part is apt to cause inflammation and ulceration, and the wall may then very easily be perforated by the bougie, or even spontaneous rupture may take place. The mucosa in cases 2 and 5 was in a state of chronic catarrh — having a glassy white appearance.

Spasms occur frequently in strictures, causing temporary complete closure, which was seen in cases 1 and 2 and to some extent in case 5.

The strictures may be single or multiple or total, when the entire length of the œsophagus is involved.

Any part of the tube is exposed to the corrosive poison and is consequently liable to become the seat of a stricture, but there are certain places of predilection, namely, a little below the beginning of the organ, about the level of the bifurcation, and at the hiatus. The reason for this predilection will be discussed in another part of this article.

The cardia and the part 2–4 cm. above are rather rarely affected.

The term "impermeable stricture" is only a relative one, because very few cases, absolutely impermeable, have been found postmortem. Four of my cases belonged to this class.

In the five cases to be presently reported the different types of stricture are represented with the exception of the stricture throughout the entire œsophagus.

The tubular strictures are mostly found in the lower thoracic part and at the bifurcation. In case 2 there were two annular strictures in the lower part with linear strictures between

TABLE IV. 110 CASES OF CICATRICIAL STRICTURES OF THE ŒSOPHAGUS

| | Total | 2d year | 3d year | 4th year | 5th year | 6th year | 7th year | 8th year | 9th year | 10th year | Children, no Age Given | 10–20 | 20–30 | 30–40 | 40–50 | 50–60 | 60–70 | Adults, No Age Given |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Single strictures: | | | | | | | | | | | | | | | | | | |
| *a.* Cervical part | 17 | 3 | 3 | 1 | ... | 1 | ... | ... | ... | ... | ... | 2 | 2 | 3 | 1 | 1 | ... | ... |
| *b.* Upper thoracic part (including bifurcation) | 24 | 2 | 2 | 4 | 1 | 2 | 1 | 1 | 1 | ... | ... | 2 | 3 | 3 | 2 | ... | ... | ... |
| *c.* Lower thoracic part (including cardiæ end) | 42 | 3 | 2 | 5 | 2 | 2 | 3 | ... | 2 | ... | 1 | 5 | 7 | 5 | 3 | ... | ... | 2 |
| Multiple strictures: | | | | | | | | | | | | | | | | | | |
| *a.* Cervical and lower thoracic | 7 | 2 | 2 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2 | ... | ... | ... |
| *b.* Cervical and upper thoracic | 6 | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 | 1 | ... | ... | ... | 1 | 1 |
| *c.* Upper thoracic and lower thoracic | 7 | 1 | ... | ... | ... | ... | 1 | ... | ... | 1 | ... | ... | 1 | ... | ... | ... | ... | 3 |
| *d.* Upper thoracic | 2 | ... | ... | ... | 1 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| *e.* Lower thoracic | 4 | ... | ... | ... | 1 | ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... | 1 | ... | 1 |
| Stricture of the entire œsophagus | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... |
| | 110 | 12 | 9 | 11 | 6 | 6 | 5 | 1 | 4 | 1 | 1 | 10 | 14 | 12 | 8 | 2 | 1 | 7 |

them, forming practically one tubular. In case 5 there were two tubular in the lower part. The cervical part is not often the seat of the tubular variety.

Bronchitis due to food entering the larynx may be a complication.

The accompanying table, which includes my own cases together with 105 cases that I have collected from literature, from the year 1890 to 1910, shows the relative frequency of the seats of the strictures:

One-half of these cases occurred in children under 10 years of age. Of the other half 33 were male and 21 female. In one adult the sex was not mentioned.

The corrosive poisons swallowed in these cases were:

| | |
|---|---|
| Lye | 82 cases |
| Hydrochloric acid | 7 cases |
| Sulphuric acid | 5 cases |
| Nitric acid | 3 cases |
| Mixed acids | 2 cases |
| Sol. chlor. zinc | 2 cases |
| Ammonia | 2 cases |
| The name of the corrosive not specified in | 6 cases |

A table of 100 cases, collected from literature by von Hacker previous to the year 1889, shows about the same proportions as to the frequency of the seat of the stricture.

*Symptoms.* After the swallowing of a corrosive poison, there may be difficulty in deglutition for some time, until the acute inflammation has subsided, and then gradually symptoms of obstruction set in. In some cases there is apparently no ill effect following the taking the poison, until from two to eight or more weeks after, food is suddenly regurgitated.

When the stricture is of some standing, and particularly if it is in the lower part, mucus will collect in the dilated tube above and be regurgitated from time to time. If the stricture is at the upper end ingesta will be rejected immediately. A persistent bronchitis may be present from the repeated dropping of food into the air passage.

*Diagnosis.* A large sized bougie or sound is first introduced to determine the site of the stricture, after which bougies of smaller calibre are used to ascertain to which size the stricture is passable. If a tight stricture is in the upper end I use a curved metal tube (Fig. 1) that reaches down to the inlet of the œsophagus, filled with 6 to 12 long, fine filiform whalebone bougies, which I have had made for this purpose. By gently pushing the one filiform after another, one of them will find its way through the stricture. The same maneuver is repeated if there is one below.

If the stricture is lower down and the opening not readily found the œsophagoscope should be introduced. To manipulate a long slender instrument through the œsophagoscope is awkward and I have devised an instrument (Fig. 2) by which it is an easy matter to direct the thin filiform bougie in searching for the opening through the stricture. For this same purpose and also to determine the length

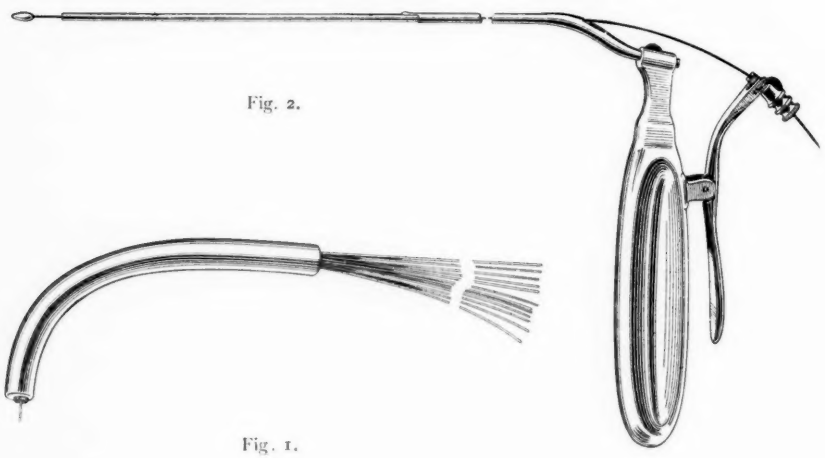

Fig. 2.



Fig. 1.

of the strictures I use long bougie a boules of different sizes, and made of thin wire (Fig. 2).

In a case of multiple strictures, where the upper stricture is narrow, the size and length of the lower ones can not be determined until the upper one is dilated, unless the lower ones are still narrower than the first.

The appearance of the strictures as seen through the œsophagoscope vary greatly as seen in the cuts.

*Differential diagnosis.* Œsophagospasm, cardiospasm, diverticulum, malignant or benign growth; strictures from peptic ulcer, from œsophagitis phlegmonosa, or following diphtheria, scarlatina, syphilis, and tuberculosis can be differentiated by the history, and œsophagoscopic examination. Specimen for microscopic examination should be taken if there is a question of tuberculosis or malignancy. Pressure from the outside in the cervical part by enlargement of the thyroid gland or new growth, and pressure from without in the mediastinum by enlarged lymphnodes or new growth should be excluded by the œsophagoscope. Aneurysm of the aorta may be a contraindication to the use of the œsophagoscope.

*Prognosis.* Superficial strictures, like those in the cervical part of case 1 and 3, do not show any tendency to contract after having been fully dilated. The same can be said about the stricture of the lower thoracic part in case 1, in which bougie 34 F. passes through without the least resistance, although it has only been introduced every 5 to 6 months since three weeks after the operation, performed nearly two years ago.

The immediate results after the cutting of the strictures are most excellent, and I have reason to believe that the ultimate prognosis will be favorable, provided proper after care is taken, but, of course, that can not be determined until years have elapsed after treatment. Strictures not involving the entire circumference of the œsophagus will naturally give the best prognosis, particularly in children, because in the latter the organ grows. In the tubular form of stricture the least favorable prognosis is to be expected, but to judge from case 5, there will not be any difficulty in maintaining the caliber of the œsophagus after the cutting.

In 100 cases of œsophageal strictures from caustics, tabulated by von Hacker, there were 47 deaths. Of these 47 cases, 25 had been treated by bougie alone, and the cause of death was known in 20 of them. In ten of these latter, perforation was the cause, six of which were due to the bougie and two to foreign bodies. In 34 cases of cicatricial strictures that came to post-mortem in the Pathologic-anatomic Institute, in Vienna, from 1877 to 1886, death was due to perforation by the bougie in ten cases; in six it was due to perforation from ulceration; the rest of the cases died after operation or from marasmus, inanition, or tuberculosis of the lungs.

AN EXPLANATION WHY STRICTURES FROM CORROSIVE POISON FORM AT CERTAIN PARTS OF THE ŒSOPHAGUS IN PARTICULAR

When a large quantity of concentrated corrosive poison is swallowed death usually follows. In the cases that survive, and in which strictures form, the substance swallowed has been either less concentrated, or only a small quantity has been taken, or both. Case 5 had taken a large swallow of the lye solution, but had just had a substantial meal, which further diluted the solution and prevented destructive influence upon the stomach. Case 1 put a small piece of Babbitt's lye in his mouth, resulting in extensive scars on the tongue, palate, etc. I presume that the piece of lye has been small and therefore quickly dissolved in the saliva, or that it was spat out again, because otherwise the destruction to the œsophagus and stomach would have been correspondingly extensive.

The extent and depth of the stricture will depend upon the degree of concentration and the quantity of the corrosive substance taken, as well as the length of time that the tissues are exposed to it.

No part of the œsophagus is exempt from stricture from corrosives, but there are certain places of predilection, namely: the cervical part, the level of the tracheal bifurcation or somewhat above and at the hiatus.

The table of clinical cases shows that the frequency of the seat of stricture increases from above downward in the order named.

The predilection has been explained by the physiologic constrictions, by the curves of the œsophagus, and by the modus operandi of the mechanism of deglutition, as taught by Kronecker and Meltzer. According to these physiologists, fluid is not moved through the œsophagus by peristalsis, like solid food, but is squirted down into the lower part of the organ, where it remains for a fraction of a second before it is passed into the stomach.

Mehnert (6) has tried to show that all the annular strictures can be traced back to the physiologic constrictions.

The recent physiologic experiments of Schreiber (9) on the mechanism of deglutition, convinced this investigator that fluids are moved through the œsophagus in the same way as solids, i. e., by peristalsis.

The results of Schreiber's experiments are briefly as follows:

The bolus placed on the back of the tongue is pressed behind the fauces by the myelohyoid muscle and the space towards the mouth and the nasopharynx is shut off. The hyoglossi and the thyrohyoid muscles now take part in forcing the ingesta deeper into the pharynx, from where the constrictores medii together with the geniohyoid muscles drive the bolus into the œsophagus, while the constrictor inferior relaxes. The latter muscle closes behind the bolus. The œsophageal peristalsis then brings the bolus to the stomach. The propelling force of the buccopharyngeal deglutition mechanism, particularly that of the constrictores medii, is sufficient to drive the ingesta from 1 to 4 cm. into the cervical part of the œsophagus, but while this force is in action, the peristaltic wave starts from the upper end of the œsophagus, and carries the bolus from where the buccopharyngeal force ceases (at Pr. Fig. 3) into the thoracic part (to Pr. II, Fig. 3) from where further peristalsis takes it to above the epicardia. After remaining here for a brief period it is moved into the stomach.

By epicardia Schreiber understands the part of the œsophagus immediately above the cardia — 4 to 5 cm. long — comprising the abdominal and diaphragmatic parts, and which according to Schreiber, effects the closure toward the stomach, in reality the physiologic cardia. He also styles this part the expressor ingesti inferior, while the constrictor muscles furnish the expressor ingesti superior. The constrictor inferior muscle closes the inlet to the œsophagus.

In a number of personal observations through the œsophagoscope, in cases of so-called cardiospasm, I have found that the epicardia is the part which is in spastic contraction.

Schreiber found the speed with which the ingesta traverses the distance from the mouth to the stomach to be:

From the mouth to the upper end of the œsophagus ..... 0.4–0.5 sec.
From the mouth into the cervical part ..... 0.6–1 sec.
Equal to a speed of 32–34 cm. per sec.

From the upper end of the œsophagus to about the level of the bifurcation.....0.8–1 sec.
Equal to a speed of 20–25 cm. per sec.
From the bifurcation to the epicardia.....2.8–3.5 sec.
Equal to a speed of 5–10 cm. per sec.
Bolus pauses above epicardia about.....0.3–0.5 sec.
From above the epicardia into the stomach from a fraction of a second to 2–4 seconds (See Fig. 4).

In a case where I had to drain the posterior mediastinum through an incision on the inner side of the sterno cleido mastoid muscle, I introduced a tube through the wound into the mediastinum, and while letting the patient swallow milk I was able to observe through the tube the rapid peristaltic wave.

Experimentally then the bolus arrives to the epicardia in about five seconds after the beginning of the act of swallowing, but in reality in a somewhat shorter time. To the stomach it arrives in from 7–10 seconds.

The size and the form of the bolus and the individual's desire to swallow may influence the speed. The propelling force may come to a momentary halt by retching and vomiting.

In the upper part of the canal the speed is fairly constant, while in the thoracic part it is never the same, i. e., it may vary on short stretches (2–5 cm.) by slowing up or increasing. At times the speed in the thoracic part, on a short stretch, may be as great as in the cervical part. This was observed even in the lower thoracic part, where the unstriped muscle fibers are found almost exclusively.

In Fig. 3 it will be seen that there are sharp curves at Pr. and Pr. II, corresponding to about the middle of the cervical part of the œsophagus and to about the level of the bifurcation or somewhat above, respectively. These marks indicate that there has been a temporary, although very short stop in the movement of the bolus. Beyond Pr. II the line diverges somewhat from the former direction, which means a slower speed.

The peristaltic wave propelling the ingesta does not disappear immediately, but remains back of it until the epicardia opens and the mass is forced through the cardia into the stomach. Fluids are squirted into the stomach with a sizzling sound.

It seems to me that the interesting question why certain parts of the œsophagus are seats

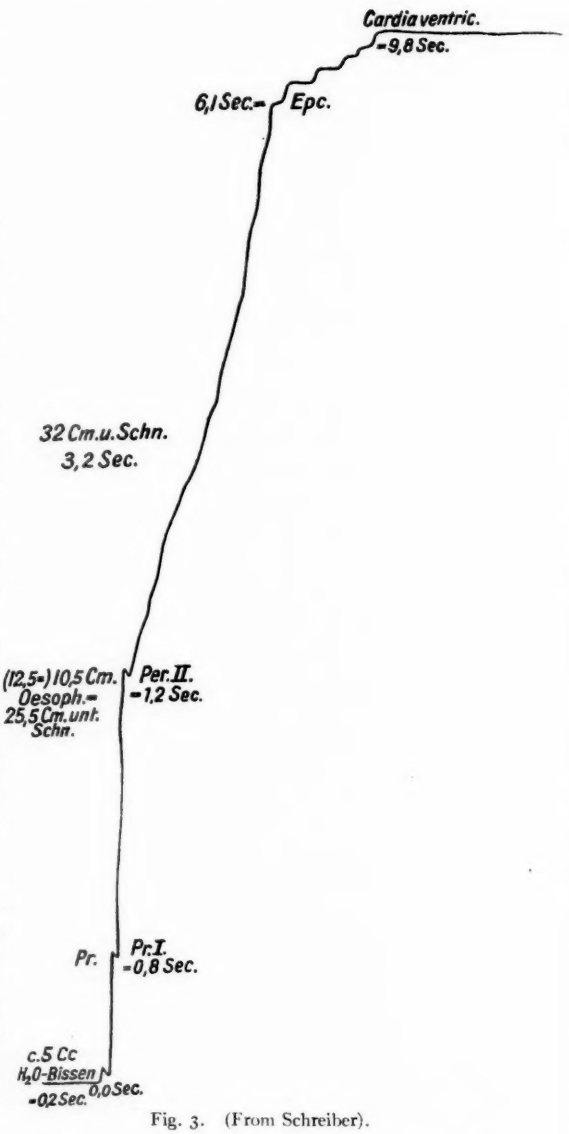


Fig. 3. (From Schreiber).

of predilection of strictures (from corrosives) can be more satisfactorily explained on the basis of Schreiber's views of the mechanism of deglutition.

We have found:

1. That the width of the œsophagus increases from above downward in most bodies.

2. That the speed with which the bolus travels decreases from above downward.

3. That the relative frequency of the seats of stricture increases from above downward.

The ingesta being forced through the pharynx by the buccopharyngeal muscle apparatus, must necessarily come in contact with the epithelial lining of the entire canal through which it passes; likewise in the œsophagus where it is moved along by the peristaltic wave.

When we found that the parts where the speed is the greatest are practically exempt from strictures — like the pharynx — or less frequently affected like the upper part of the œsophagus, while the parts where the speed is the slowest, or where there is a momentary stop — so uniformly corresponds to the seats of the strictures, it does appear as if the speed rate, at the different parts of the canal, is the determining factor.

If the physiologic constrictions were determining factors in regard to the places of predilection the order of frequency of the seats or the strictures ought to be reversed, because the width of the œsophagus increases from above downward. The question could perhaps come up for consideration if the physiologic constrictions have some relation to the length of the peristaltic waves.

If curves of the œsophagus were present, these could hardly come into consideration where the ingesta is moved along by the contracting ring of the peristaltic wave behind it.

The corrosive fluid is propelled with lightning-like speed over the mucous covered thick layer of epithelium, so that the latter is exposed only for a very brief period of time to its action, except at the places mentioned, where the duration of contact is somewhat longer and consequently the insult deeper. The lower thoracic portion affords a striking example of the effect of the lingering of the ingested corrosive, because above the epicardia it remains for 0.4 to 0. 5 seconds before propelled into the stomach, and here we find the most extensive and deepest strictures.

At Pr. and Pr. II, Fig. 3, corresponding respectively to the middle of the cervical part of the œsophagus and to about the level of the tracheal bifurcation or somewhat above, are also favorite seats for strictures, and here again

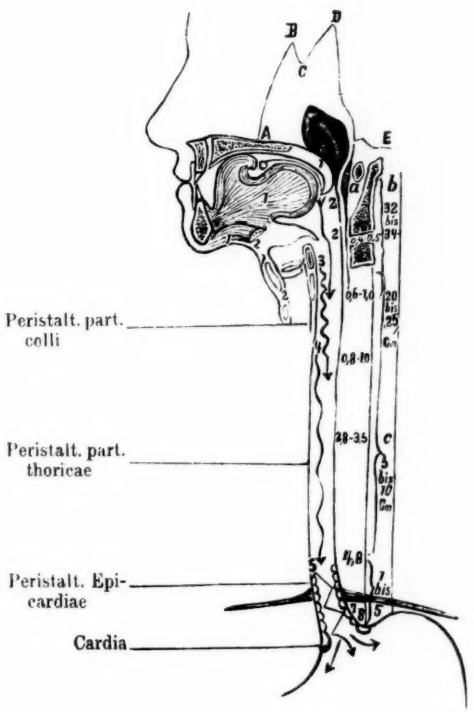


Fig. 4. (From Schreiber.)

we have found that the propelling force comes to a momentary halt.

From the bifurcation to the epicardia the speed rate is only 5 to 10 cm. per second, and it can readily be understood how with the momentary stop at Pr. II and from there on the slow speed, this invites to longer contact with the poison and consequently to formation of strictures. It should also be remembered that the speed, even in the upper thoracic part, may slow up on a short stretch, and that retching may bring the propelling force to a halt and expose the mucosa to a longer contact with the corrosive poison.

The numerous layers of squamous cells, which line the œsophagus, afford an excellent protection against insult, but where, in a given case, patches of the œsophageal cardiac glands mentioned above, are present, it would seem as if such an area, only covered by one layer

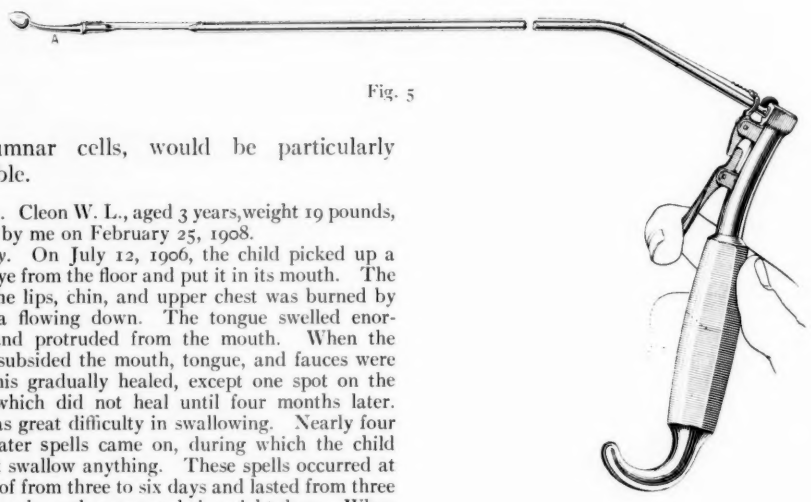


Fig. 5

of columnar cells, would be particularly vulnerable.

CASE 1. Cleon W. L., aged 3 years, weight 19 pounds, was seen by me on February 25, 1908.

*History.* On July 12, 1906, the child picked up a piece of lye from the floor and put it in its mouth. The skin of the lips, chin, and upper chest was burned by the saliva flowing down. The tongue swelled enormously and protruded from the mouth. When the swelling subsided the mouth, tongue, and fauces were raw. This gradually healed, except one spot on the tongue, which did not heal until four months later. There was great difficulty in swallowing. Nearly four months later spells came on, during which the child could not swallow anything. These spells occurred at intervals of from three to six days and lasted from three to eighteen days, the average being eight days. When the spell was on the bowels never moved. The child was fed on milk exclusively, which it took from a nursing bottle, because if it attempted to drink from a cup, the passage was immediately shut off. During the free intervals the child took enormous quantities of milk in this way to make up for the period of starvation. If it tried to eat any solid food, or if it was exposed to draught, an attack was precipitated. The child was reduced to skin and bone and death was imminent, when nutrient enemata were employed, under which the child improved somewhat.

Attempts to pass instruments through the stricture had been made, but without success, and gastrostomy had been recommended.

*Examination.* A very poorly nourished boy. Coughs a great deal.

About the junction of the anterior and middle third of the tongue is a white scar and likewise on both anterior pillars of the fauces and right tonsil. On the soft palate is also a large stellate scar. There is pronounced bronchitis. Bougies meet an obstruction at 10.5 cm. from the incisor teeth. The curved tube (Fig. 1) filled with filiform whalebone bougies was now introduced and an entrance made, but in passing further down another obstruction was met with at 13 cm. from the teeth. After dilating the first stricture somewhat the filiform passed through the second one and a fine perforated urethral bougie was threaded on to the filiform and pushed through. At 24 cm. from the teeth a third stricture was found, which admitted a somewhat larger caliber bougie than the upper ones (Fig. 6).

The upper two strictures were dilated to 32 F. The lower could not be dilated beyond 12 F., and I noticed that the right side of the bougie was flattened after having been through the stricture. The child could now eat semisolid food and was gaining in weight. One day while eating an orange the child suddenly had one of his former spells and was unable to swallow anything, and the former severe cough returned. Although I could pass bougie 32 F. through the upper strictures the patient could not swallow. I then poured milk into the stomach through a rubber catheter. During this the child had a violent coughing spell and coughed up two small pieces of the orange, after which there was no hindrance and the cough ceased. I believe that these two little pieces of orange had lodged in the larynx or further down and caused an irritation, which produced a spasm of the upper end of the œsophagus.

How to treat the lower stricture was now the question. It was quite evident that any attempt to dilate it did not make any impression upon the cicatricial tissue, but very likely simply overstretched the unaffected part. It occurred to me that to incise this would be rational, provided the depth of the incision could be controlled. To this end I devised an instrument (Fig. 5) on to which is screwed the knife (A from the plate, Fig. 18) with which to cut this stricture. Under chloroform anæsthesia an 8 mm. œsophagoscopic tube was introduced, and the stricture, as surmised, found not to involve the entire circumference. Three incisions were made into this stricture as illustrated in Fig. 7. After this dilatation was performed. Six days later increasing sizes bougies were introduced and dilatation carried to 34 F. which then was kept up every two to three days for three weeks.

I did not see the patient again for four months, as the family left the city, and although no treatment had been used in the meantime, No. 34 F. passed through as readily as it did four months previous. The patient was in an excellent condition and had gained 24 lbs. in weight. Since then I have introduced 34 F. every four to six months.

CASE 2. Hazel L., aged 5 years. Has had none of the diseases of childhood. Had otitis media at the age of two years, which lasted two years.

On February 25, 1906, she drank of a solution of lye (one tablespoonful of Babbitt's lye to a cup of water). The child was immediately given milk and sweet oil until it vomited. Nothing was seen in the mouth, only the lips were somewhat dry and shiny. No ill effects were noticed until about six weeks later, when milk was regurgitated. The child, who had been eating everything up till then, now became rapidly emaciated, and soon rectal feeding was resorted to. Absolutely nothing could be swallowed for a week or two at a time, then the child would be able to take large quantities of milk, and again there would be complete obstruction for another week or two. She could not get any water down for the following two years.

The child would often keep on drinking cold water and regurgitate it until she was blue and cold, and then suddenly milk would pass down. The rectal feeding was kept up for one and one-half years, with short intervals. Bougie treatment had been tried, but without avail. In the summer, 1908, milk commenced to pass through with less difficulty, and she could also take water. Occasional regurgitation of milk was noticed hours after drinking it. During the last year there has only been complete obstruction when the child had a cold. She has tried to eat solid food every day, but it invariably comes back, and milk has been her only food. No cough.

*Examination.* No scars in mouth or pharynx. General examination negative. A bougie introduced into the œsophagus meets an obstruction at 14 cm. from the incisor teeth, and no instrument can be passed further.

Under chloroform anæsthesia œsophagoscopic examination through an 8 mm. tube reveals a dilated œsophagus above the stricture, the mucosa of which was in a catarrhal state. No opening could be seen, but by lifting a small fold of the mucosa, to the left posteriorly from the center (Fig. 8), a very small bougie a boule could be passed 3 cm. down, where another obstruction was encountered. A long filiform whalebone bougie slipped through this after considerable search, and a perforated bougie 9 F. was threaded on to the filiform and pushed through after which the upper stricture was cut and dilated, and then the lower. Between the two strictures, which were annular, white linear scars were seen (Fig. 9).

*After treatment.* 35 F. bougie introduced every other day for one week, then once a week, later every two weeks.

The long periods of spastic closure in both these cases are of interest. In case 1 it was explained by the food entering the larynx and causing irritation, but not so in case 2. However, any lesion of the œsophagus may give rise to the spasm, thus I have seen periodical spasms in case of ulcer in the middle third of the organ, in carcinomatous ulcer of the epicardia, in simple goiter pressing upon the œsophagus from both sides, etc.

The ingenious method of case 2 in drinking cold water and regurgitating it until the spasm relaxed, reminds me of patients with cardiospasm, who learn to take large quantities of water with which to press the food down.

In case 2 the water has evidently had an antispastic effect, but it is not so clear why the child was unable to swallow water. This patient is now perfectly well and eats everything.

Case 3. Edith J., aged 18 months. Six weeks before seen by me, the child, while playing in the yard, drank from a lye can in which some remnants had been dissolved by rain. The child was immediately given milk and later sweet oil. Blebs formed on the lips and in the mouth. The child could not take any solid food after the accident, and was fed on milk and soups, until four weeks later, when it became difficult to swallow milk. Hardly anything has passed through during the last two days, and when brought to me the child could not swallow anything. The patient has lost greatly in flesh, and is very restless. It is constantly calling for water. Urine is very scant.

*Examination.* White scars are seen on the soft palate. The bougie meets obstruction at 10.5 cm. from the incisor teeth.

The curved tube (Fig. 3) containing filiform whalebone bougies was introduced and a filiform passed through the stricture. On this a 6 F. urethral bougie was passed and the stricture dilated to 32 F. There was no obstruction below the cervical stricture because 32 F. was passed into the stomach without hindrance. For this reason bougie 32 F. was only introduced sufficiently far to keep the cervical stricture open at the subsequent treatments.

Eight weeks later 32 F. was introduced with the intention of again passing it into the stomach, in order to ascertain if the lower œsophagus was still patulous. To my surprise I found a very resistant, but only moderately contracted stricture at 16 cm. and another at 21 cm. from the teeth (Fig. 10).

Œsophagoscopic examination under chloroform anæsthesia reveals a short tubular stricture at 16 cm. from the incisor teeth about 1 to 2 cm. long. Four incisions were made into this and the œsophagoscope pushed through. At 21 cm. a half moon shaped stricture was seen on the left side, only extending half ways around the wall, and it did not encroach much upon the lumen of the organ. A little below it, but on the opposite side was seen an exact counterpart of this stricture. Incisions were made in both of them followed by dilatation to 32 F.

The cervical stricture in this case was rather superficial, and, although it was difficult to enter, was easily dilated.

The stricture at 16 cm. was discovered accidentally and had not given rise to any symptoms. It accepted an 18 F. bougie, but was very resistant to larger sizes. This stricture evidently involved the deeper tissues, but had been slow in contracting.

The case illustrates the necessity of passing the bougie through the entire œsophagus every time it is used for dilating purposes. The patient is well and can eat everything.

Case 4. Victor L., aged 18 months. The child drank of a solution of lye seven weeks previous to coming under my care. Milk, white of eggs, and later oil was administered. The tongue, lips, and mouth swelled,

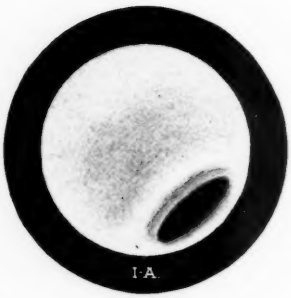


Fig. 6.

Fig. 7

Fig. 8.

Fig. 9.

Fig. 10.

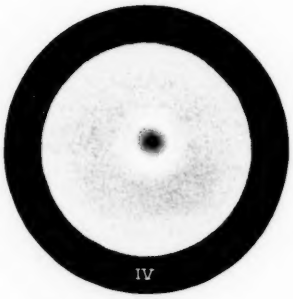


Fig. 11.

Fig. 12.

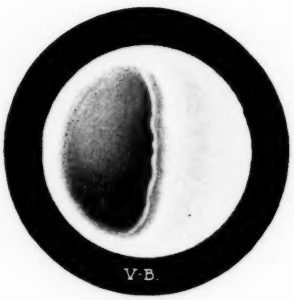


Fig. 13.

blistered, and bled, and the patient could not close its mouth for several days. For the first few days the child took only cream, then milk and crackers, etc., but three weeks later it became difficult to swallow milk and water. The patient has been constipated since the accident, and has lost much in weight. Attempts made to introduce bougies had not been successful. After the attempt with the bougie two days previous to coming to my office the child had gulped up fresh blood.

*Examination.* Stricture found 17 cm. from the incisor teeth.

Under chloroform anæsthesia the œsophagoscopic tube was introduced and the stricture, about 1 cm. long, incised, followed by dilatation to 32 F.

The small, circular opening was seen in the center (Fig. 11).

The patient is well and can eat everything.

CASE 5. H. C. G., aged 50 years. Married. Had small-pox in childhood, later erysipelas and typhoid fever. Had inflammation of the bowels 30 years ago.

Two years ago, by mistake, he drank a solution of lye. He vomited soon after and was ordered to take vinegar, of which he took a wine-glass full. He had just had a hearty meal when the accident occurred. Two weeks later it became difficult to swallow solid food, and later on he commenced to gulp up thick mucus.

Bougie treatment was begun and has been used once a week since, sometimes twice weekly. He chews the meat, but only swallows the juice, otherwise his diet is milk, eggs, and soups.

General examination negative.

*Examination of the œsophagus.* The œsophageal sound meets obstruction at 27 cm. from the incisor teeth. This stricture admits a bougie a boule 16 F., but the instrument again stops at 34 cm. from the teeth, and can not be passed through this second stricture. After some manipulation a No. 12 F. bougie is passed. A third stricture is found at 37 cm. and a fourth stricture is encountered at 41 cm. from the teeth.

After anæsthetizing the throat with a 10 per cent cocainadrenalin solution the œsophagoscope is introduced, and considerable thick mucus pumped out from the dilated portion, which had formed above the first stricture. The mucous membrane of the dilated part had a glassy, white appearance and is in a state of chronic catarrh. The opening of the stricture is situated somewhat to the left of the center and looks like a small funnel flattened from side to side. In the deepest part of this the opening is found. Exploration with the probe gives the impression that the stricture is about 3 cm. long. Two incisions are made into this and the stricture dilated somewhat. Fig. 12 shows the first stricture after the two incisions have been made, but before it is dilated.

In subsequent sittings several radiating incisions are made, and the stricture dilated to 45 F. The patient did not experience any pain from the cutting. The œsophagoscope was now passed down to the strictures at 34 cm. On probing this it seems as if the scar tissue is thicker on the right side than on the left. Incisions are made followed by dilatation. In Fig. 13 is seen the second stricture after the first cutting and dilatation. The right side is as yet occupying nearly one-half of the lumen, while the left side has largely yielded. Several incisions are into the thick part, and dilatation carried to 45 F. The distance from 34 to somewhat beyond 41 cm. is evidently one long stricture, the obstructions at 34 cm., at 37 cm., and at 41 cm., being exaggerated parts of it.

The distance from 34 cm. to 37 cm. has been the most difficult to treat.

The patient is well and can eat any kind of food.

In the schema (Fig. 14) is shown in side view how the strictures appeared to me through the œsophagoscopic tube in this case.

No. 45 F. bougie will be introduced once a week.

*Treatment.* Although the treatment of the acute condition from poisoning by corrosives, does not properly belong in this article, a few words on the question may not be amiss.

From the discussion of the physiology of the mechanism of swallowing, we know that the strictures, especially form in certain parts of the œsophagus, for the reason that these parts are exposed to contact with the poison for a fraction of a second longer than the rest of the passage. This means that the damage is done in a fraction of a second.

Therefore, to prescribe antidotes, which would take some time to obtain, would be useless. To make the patient drink large quantities of water or milk, any one that might be on hand, in order to dilute the poison and then induce vomiting, would perhaps be of more benefit than anything else. If vinegar is administered after taking lye, it must be diluted. Case 5 stated that the vinegar he took to counteract the lye caused him a great deal more pain than the lye, and the value of it is questionable. The use of the stomach tube is contraindicated in these cases, as it may cause additional insult to the already injured organ. The stomach must be emptied by inducing vomiting. Otherwise the treatment is symptomatic. The use of instruments should not be resorted to until the acute condition has subsided.

*Resumé of operative treatment.* If, in a case with the history of having swallowed corrosive poison, a tight stricture is found in the cervical part, a filiform whalebone bougie is introduced by the aid of the curved tube (Fig. 1), and on the filiform for a guide a small sized perfor-

ated bougie is pushed through the stricture. If the latter is superficial and yields readily, increasing sizes of bougies can be introduced in rapid succession until the largest size, corresponding to the age of the individual, is reached.

After full dilatation is accomplished the largest bougie is introduced every other day for a week or two, then once a week. After a few weekly treatments the intervals can be lengthened. On each introduction the bougie should be passed through the entire length of the œsophagus, and if conical bougies are used the tapering end of the instrument must enter sufficiently far into the stomach to allow the main part of the instrument to come in contact with the entire tube.

The bougie is left in situ for ten minutes in very young children, in older children somewhat longer and in adults from fifteen to thirty minutes. If the stricture is resistant, the œsophagoscope should be introduced, and the length and form estimated. For this purpose the bougie a boule operated through the instrument shown in Fig. 2, may be used, but before cutting I invariably introduce the bulbous probe (Fig. 6) into the stricture, and by pressing the lever, as indicated by the finger in the cut, the lower end of the instrument, which is provided with a spring, is flexed and the bulbous tip brought against the wall underneath the stricture. When now the instrument is slowly withdrawn, while the tip is pressed gently against the wall, information about the length and form of the stricture is gained. This is important because the stricture may be thicker on one side than on the other, and the incisions must be planned accordingly.

The knife is now introduced and the necessary number of incisions made. In children the 1 to 1.5 mm. blades may be used, in adults the 2 to 3 mm. blades.

If the stricture is valvular two or more incisions are made followed by dilatation.

Annular and short tubular strictures should receive a number of incisions radiating from the center toward the periphery. If there is more than one stricture present, the upper one must be cut and dilated sufficiently to allow the œsophagoscopic tube to pass through, before incision into the lower one can be made, because the cutting should only be done under

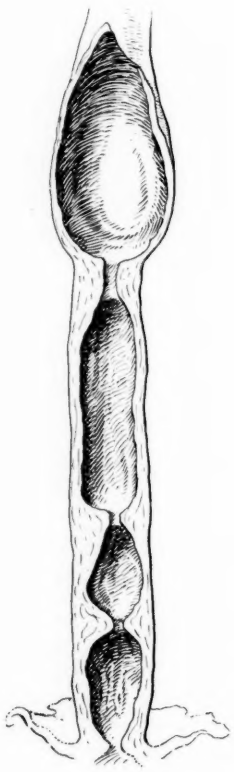

Fig. 14.

the guidance of the eye. The above mentioned forms of strictures can be dealt with in one sitting, but in the case of a long tubular a number of sittings may be necessary, for the reason that, although the part be cut and dilated to a degree apparently sufficient to admit the œsophagoscopic tube, the latter may injure the unelastic scar tissue in being forced through. The cut part of the stricture has to be made to melt away, so to speak, by repeated dilatation after the cutting, before the tube passes through without resistance. Then the œsophagoscopic tube can be crowded gently against the uncut part, the region below explored by the bulbous bougie and several radiating incisions made, followed by dilatation. This is repeated until the entire length of the stricture is opened. It is a somewhat slow procedure, but it is safe, and in adults it can be done under local anæs-

Fig. 15.

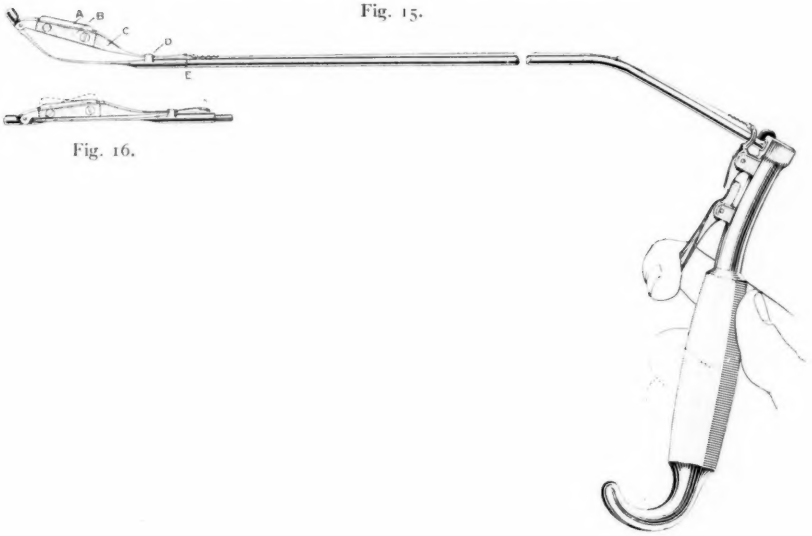


Fig. 16.

thesia and the patient can attend to his business. It is essential that several radiating incisions be made into the stricture, because when this is subsequently stretched by the dilating instruments it yields more evenly in all directions.

The after treatment consists of introduction of bougies, first 4 to 6 days after the operation, then every two days for a week or two, then once a week for 3 to 5 months, after which treatment every two weeks for 5 to 6 months. After that the intervals can be lengthened, but these cases should have a full sized bougie introduced now and then.

The operation of incising strictures of the œsophagus in this way is a safe one — done as it is under the guidance of the eye and with

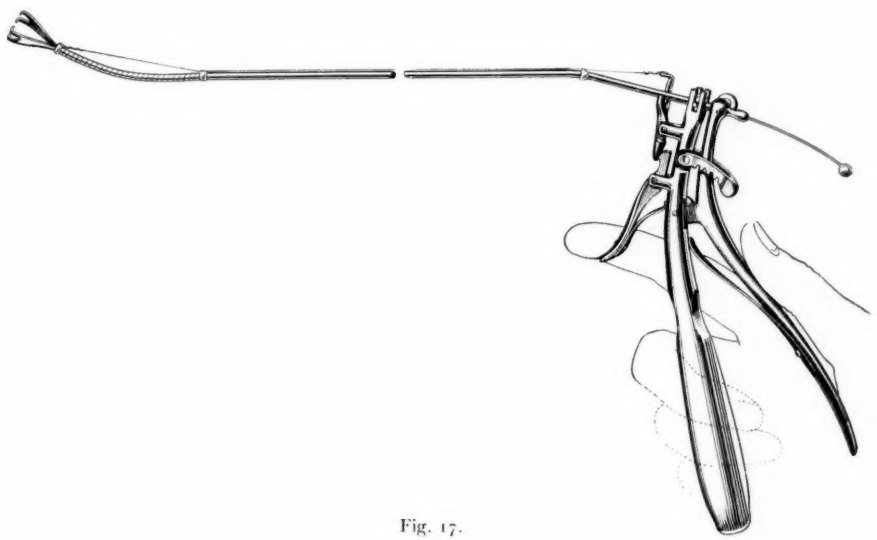

Fig. 17.

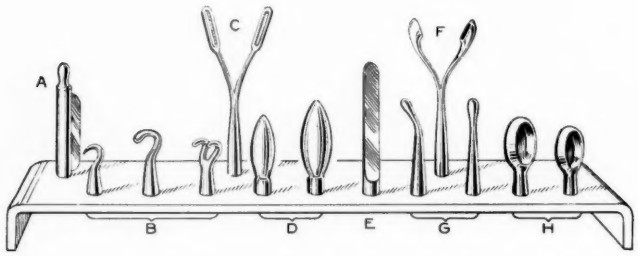


Fig. 18.

instruments which are guarded and controllable.

The bulbous bougie is a safeguard, not only because the shape and length of the strictures can be determined by it, but the instrument is so delicate that the forefinger on the lever can feel the consistency of the tissue, whether it is hard scar tissue or soft normal tissue.

I feel justified in making the statement that the operation of gastrostomy, for the purpose of feeding or for retrograde dilatation, in cases like those here described, should not be resorted to until this method of treatment has been tried. I have no deaths in the cases treated.

Four of my cases had been advised gastrostomy.

In children I use the instrument devised by me two years ago (Fig. 5) by screwing the knife (A, Fig. 18) on to the shaft (B). This is a modification of my first instruments, published three years ago. The instrument consists of a guard into which can be slipped a small blade, and the guard is screwed on to the shaft.

When the lever is pressed upon, as indicated, by the finger in the cut, the spring in the distal end is flexed and the blade brought against the part to be cut, the incision being made from below up. The projecting distal end of the guard protects the tissue beyond. The blades are of different sizes, from one to three mm., and the guard prevents the cutting deeper than the width of the blade.

More recently I have devised another cutting instrument (Fig. 15), with which incisions can be made from below up and from above down. It consists of the piece C, which is hinged on to the flexible end of the shaft. A part in the middle of this piece, C, is filed away and the plate, B, fitted in. Between these two pieces the blade, A, is slipped in and the screws tightened. The proximal end of the piece, C, is made into a spring and slides in the buckle, D, so that when pulled upon by pressure on the lever it flexes the lower end of the shaft. In Fig. 16 is seen the instrument relaxed and the dotted lines indicate the different ways in which the blade can be arranged. Only one blade is necessary for this instrument as it can be pushed in or pulled out from between the two pieces, B and C, as desired.

To the armamentarium belong also the forceps (Fig. 17) built on the same principle — the lower end can be flexed by manipulating the lever. On the plate (Fig. 18) are different forceps for removing specimens for microscopic examination, for catching foreign bodies, and also curettes, probes, applicator for silver nitrate, etc., all of which can be screwed on to the long shafts.

The advantage of this new principle is that the lower end of the instruments can be moved under the perfect control of the operator, while the long shaft is kept undisturbed against the inner wall of the œsophagoscope, in that way not interfering with the view.

To remove tissue for examination is an easy matter with the cutting forceps or the curette, as the instrument can be brought firmly against the part, and yet be so easily controlled, that it can do no harm.

This set of instruments is also for bronchoscopic work.

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# PERIODIC INTERMENSTRUAL PAIN[1]

BY N. SPROAT HEANEY, M. D., CHICAGO, ILLINOIS
Associate in Gynecology and Obstetrics Rush Medical College; Assistant Gynecologist and Obstetrician, Presbyterian Hospital, Chicago

WILLIAM O. PRIESTLY was the first to draw the attention of the profession to the periodic appearance of abdominal pain midway between the menstrual epochs. Since his article various contributions, chiefly by Englishmen, have been made, but in general they have been incomplete and unconvincing. From the prevalence of the use of the term "Mittelschmerz," one might expect to learn much concerning this subject from a perusal of the German literature, but aside from having given us an expressive name the Germans have not advanced our knowledge materially in this line.

It is the purpose of this paper, after relating the histories of three cases of intermenstrual pain, to set forth certain facts regarding the occurrence, symptomatology, and pathology, and to discuss the various theories as to the nature of this affection. The basis for this communication is a study of 66 cases, the three detailed below, 37 as cited by Rosner in his excellent paper, while 26 are collected from the literature.

CASE 1. Miss L. W., age 26, school teacher. Admitted to Presbyterian Hospital on Dr. James B. Herrick's service, November 4, 1909, for observation.

History. Menstruated first at 13, 26 day type. Moderate flow four to five days. Has a dragging pain during first days of flow, when rest is beneficial. After an exploratory operation a year ago the patient menstruated every 22 to 23 days. The last three periods have been at 24 day intervals. She never experienced amenorrhœa or hæmorrhages.

Three years ago the patient began to suffer periodical attacks of pain every 26 days, appearing 13 days after onset of the previous menstruation. The pain appears first in the right groin or to the right of the umbilicus. It is paroxysmal in character, of varying severity, often radiating to the right leg or knee, later, becomes general over the abdomen. Pain lasts usually eight to ten days, exceptionally until onset of next period. Formerly the pain was alleviated by heat and enemata so that the patient regarded her difficulty as intestinal. Recently, all measures short of opiates have failed to relieve her, since the paroxysms are severe and more persistent. During the last five months or so, the patient has noticed a mucous discharge from the vagina for four or five days preceding onset of pain, disappearing at beginning of pain. In New Mexico one year ago, she menstruated every 22 to 23 days, while of late has menstruated every 24 days; pain in both instances has followed the periodicity of menstruation. Patient feels well and free of discomfort the week following menstruation.

Associated. Always constipated, especially at the time of periodic pain. She has had mucus from the bowel but only after frequent enemata. Sleep has been poor. No symptoms of general disease. Past and family history negative. Since childhood no particular illness. Operative. Because of above related symptoms, the nature of which was not appreciated, an exploratory operation was performed one year ago, with the removal of the appendix. The patient gained 25 pounds in weight but the next regular menstruation was not improved.

Examination by Dr. Herrick revealed nothing of significance in head, neck, chest, or extremities. Reflexes normal. Hyperemic spots appear and disappear in various portions of the skin. Light stroking produces a marked "tache cerebrale." Patient quite nervous. Has now the period of pain. The abdomen presents the 10-inch scar of a mesial incision, midpoint at umbilicus. Tenderness general over the abdomen, especially marked in right iliac and hypochondriac regions.

November 15, 1909, Bimanual examination by the writer just after menstruation. External genitalia and vagina, normal virginal findings, cervix conical, uterus in normal position, no abnormalities found. Right ovary very tender. Left side definitely larger than right, no especial tenderness. Blood 85 per cent

[1] For Discussion see Chicago Gynecological Society Transactions.

Hb. Whites, 8,250. Reds 3,860,000. Temperature normal. Urine normal. Feces, except for small amount of mucus in two specimens, negative.

Patient during her stay required repeated hypodermics of heroin for relief of pain. Sterile water hypodermics occasionally tried without result.

November 15, 1909. After menstruation ceased, patient discharged. Thyroid extract given. November 28, readmitted in pain.

Pelvic examination. Right ovary exquisitely tender, size not ascertainable. Left ovary larger than normal. Cul-de-sac and ligaments free. Discharged after three days observation.

December 23, 1909. Patient readmitted to Presbyterian Hospital, on the fourth day of her periodic pain, and begged that something be tried to relieve her of her suffering.

Third pelvic examination Right ovary exquisitely tender. Left ovary larger than right, though not so sensitive on pressure.

December 24, 1909. Operation by the writer. Thorough dilatation of cervix and removal of endometrium for examination. Median laparotomy through old scar. Right ovary large, white, very wrinkled, sclerotic, of leathery consistence. Left ovary prolapsed, twice the usual size, normal color, several small cysts, large recent corpus luteum. Both tubes normal with patent fimbriated ends. Uterus in good position. On posterior aspect, near right cornu an intramural fibroid of approximately two cm. in diameter found. Appendix absent. Omentum adherent to old scar above umbilicus. Kidneys and gall-bladder negative. Right ovary removed. Corpus luteum resected from left ovary and ovary elevated. Fibroid nodule removed from uterine wall. Repair of herniation at umbilicus. The following day, Christmas, patient declared postoperative pains were mild compared to her periodic paroxysms. Recovery uneventful. In chair on the 10th day. Discharged from hospital on the 17th day after operation.

Pathological report.

1. Tumor nodule from the uterus shows muscle and fibrous tissue typical of fibromyoma uteri.

2. Ovaries. Left resected portion contains a normal recent corpus luteum, and a number of small follicular cysts. Both ovaries, especially the right, show a hyperplasia of the connective tissue marked towards the periphery while the walls of the blood-vessels are thickened.

3. Uterine scrapings. The glands of the endometrium are quite tortuous and are increased in number. The gland cells are normal. Many gland lumina show a granular unstained substance; a few contain blood. The interglandular substance holds a few engorged capillaries. Extravasated blood is seen at varying depths in the troma, but is especially noticed approaching the surface. Under the surface epithelium is a thin layer of free blood. In one or two places only is there blood external to the surface epithelium and here only in minute quantities. The surface epithelium is wanting only in one or two small areas.

Subsequent history. Since operation patient has been entirely free of any pain or discomfort between or during menstruation. Her only annoyance is that the periods, though regular, have been prolonged and profuse.

CASE 2. Mrs. M. B., age 31. Housewife.

Enters Presbyterian Hospital on Dr. J. Clarence Webster's service October 17, 1909.

Patient complains of menorrhagia, periodic intermenstrual pains, frequency of urination, paleness, headaches, weakness, backaches and constipation. Menstruation began at 14. Usually, periods every 28 days, exceptionally delayed one week. Flows for five days, the first day profuse enough to weaken her. Last period five weeks ago. Since onset of menstruation the patient has suffered pain periodically from about two weeks before onset of the next menstruation. This pain is generally severe, lasting one to two days and is getting worse. She has severe headache and backache at the menstrual time.

Married seven years. One child six years ago. Not pregnant since. Husband alive and well. Past medical history: Typhoid 13 years ago, otherwise negative. Past surgical history. Perineorrhaphy three years ago. Patient has been under Dr. Webster's observation for some time. Of late he noticed a rapid increase in size of the uterus, with an aggravation of her pelvic symptoms.

October 18, 1909. Operation by Dr. J. Clarence Webster. Laparotomy. Fibroid uterus of about 5 inches in diameter. Marked cystic degeneration of both ovaries. Appendix and gall-bladder normal. Extensive adhesions in upper right and left quandrants of abdomen. Complete extirpation of uterus and appendages.

Pathological report. Ovoid tumor of uterus, an interstitial fibroid, 16 x 10 x 9 cm. Congested endometrium of normal thickness. Tubes 12 cm. long, not thickened or inflamed. Fimbriated ends patent. Ovaries, normal size, filled with small cysts; no recent corpus luteum.

Microscopic. Ovaries. Multiple small follicular cysts. Tumor. Section from the center shows it to consist of loosely associated strands of smooth muscle fibres with a minimum of fibrous tissue. Mucosa shows the usual picture found in a hypertrophy and hyperplasia of the glandular tissue.

Subsequent history. Since operation the patient has been free from the intermenstrual pain.

CASE 3. Miss ——, age 22, gave to Dr. Carey Culbertson the following history:

Menstruated first at 12. Periods every 26 to 30 days. Duration eight to nine days, rather profuse. Severe cramps come with flow and last till flow is well established. Beginning at the mid-period, the patient suffers from neuralgic-like pains in lower abdomen, mostly on left side, though when severe also on right side. This pain with exacerbations lasts till flow begins when it is followed by a pain of an entirely different sort. The week following menstruation is the most comfortable time. Never pregnant. Leucorrhœa marked at times. Considerable pain on micturition, especially at menstrual time.

Past medical and surgical history: Negative, except for a sickness of three weeks one year ago due to ptomaine poisoning.

Operation by Dr. Carey Culbertson in the University Hospital, Chicago, December 23, 1909, during the period of ease.

Uterus small in antiflexion. Both ovaries enlarged, wrinkled and of leathery consistence. Tubes normal. Left ovary presents a recent corpus luteum. Internal or dilated with difficulty. Curettage. Left salpingo-oöphorectomy. Right ovary resected. No pathological examination could be made, for specimens were lost in operating room.

Post-operative history. Uneventful recovery. Absence of pain between periods. Comfortable at menstrual time. Only annoyance now is the micturition, which is unimproved.

From a review of the 66 histories many interesting and instructive points may be mentioned. Rosner gives the frequency as being 12 times among 2,350 gynecological patients.

Classifying the cases according to age, marital state, obstetrical and menstrual history, we find that 42 cases are between the ages of 25 and 35, ten are over 35 years, and nine under 25 years of age, while in five the age is unknown. Thus the largest number of cases is found during the age of greatest sexual activity. As to marital state, 15 are single, 47 married, while in four the marital state is unknown. The greater frequency of occurrence is among married women.

Discarding the 15 unmarried women, as well as 16 whose obstetrical history is unknown, we have 35 patients, eleven of whom have never aborted nor delivered, while eleven have had one pregnancy, seven have had two, four have had three, one had four, and one nine pregnancies. The high percentage of sterility deserves emphasis. Only three of these patients became pregnant after the onset of the intermenstrual pain, two aborting at the third month, while one continued to term. It is also worthy of note that all three were free of pain during pregnancy, and that menstruation ushered in a recurrence of the periodic attacks. In the other women who had been pregnant, the histories state, that the intermenstrual pain appeared first soon after the last labor. The lapse of time since the last pregnancy, in the 17 cases where this information is indicated, is in two cases, 18 months; in one, two years, in three, three years; in one, four years; in one, five years; in five, six years; in two, seven years; in one, eight years; and in one, ten years. A consideration of this last statement increases materially the importance of sterility in this affection. It is worth mentioning that only one patient gave a history of puerperal sepsis. In those who were single or sterile, two attribute the onset to cold taking, one to influenza and one to scarlet fever.

Only two patients had a synchronous onset of mittelschmerz and menstruation, one at fourteen, and one at twenty years of age. The patient mentioned above, who had scarlet fever, noticed after her convalescence, the appearance of periodic abdominal pains, which were considered at first menstrual molimina, but at sixteen years of age she began menstruating at a period not corresponding to that of the pain. In all the other patients periodic intermenstrual pains first occurred at various periods up to 18 years after the onset of the first menstruation.

The menstrual type varies. Most of the patients are regular, and except, perhaps, for a higher percentage of scantiness of flow, no particular peculiarites in habit are characteristic. Dysmenorrhœa occurs frequently, but is not a constant finding. When present, it is generally milder than the intermenstrual pain. Very few give history of clots or shreds.

Croom, for the purpose of study, has divided the cases into those presenting no other disturbances except pain, those with pain and a colorless discharge, and those with pain and a discharge of blood. The pain is the fixed symptom and is very characteristic. It appears at a time midway between the menstrual periods, in those of 28-day type on about the 14th day after the onset of the last menstruation. In case 1 the patient's type changed twice from the 26th to the 24th, and 22d-day type. The intermenstrual pain changed accordingly. In women of marked irregularity the relation of the pain to menstruation, perhaps, goes unobserved, so that the selection of women with regular type may be, therefore, only apparent, at any rate, no cases of great irregularity are noted among the sufferers. Rosner reports a case which had two attacks a month, one 14 days before the onset of menstruation, the second seven days later. The pain is distinctly periodic and appears every month with as

much regularity as menstruation itself. When once established, it is very exceptional to have intervals when the pain fails to recur, unless there be amenorrhœa, when absence of pain is the rule.

The pain usually appears first in one side of the lower abdomen or groin, the left more often than the right, is cramplike, spasmodic, and intermittent, with periods of relative or complete recession. Radiation to the leg, opposite side or occasionally to the groin is noted. The pains become more frequent and of longer duration and generally become diffuse over all of the lower abdomen with tenderness on pressure. Rarely the pain is dull and aching, more often sharp, tearing and lancinating. The suffering in milder cases is relieved by heat, in severer ones opiates are necessary. Usually the duration is two to three days, it may however, last till just preceding the next menstrual period. The time of greatest relief usually is just following menstruation. Pure-foy mentions a case where the patient had intermenstrual pains in the breasts and none in the abdomen.

In eight of the 29 cases (exclusive of Rosner's) a colorless vaginal discharge has been mentioned, in the other 21 its presence or absence is not stated. This is variously described as thin, watery, generally as mucoid. Bouilly has stated that the secretion is always uterine in origin. The discharge in some cases appears and leaves with the pain. A few authors assert that the leucorrhœa is limited to a time just prior to the subsidence of pain and seek to bring it in causal relationship to the pain. In case 1, reported in this paper, however, the leucorrhœa was limited to a time just preceding the onset of pain.

A bloody or blood tinged discharge is only exceptionally seen, once only in the 29 cases cited above. When present it may occur as a pink tinged fluid or as a slight hæmorrhage resembling a scanty menstruation. When present in any definite quantity it might be considered as a form of menstruation, and classified under this head, which perhaps accounts for the few such cases reported as mittelschmerz, where pain is the distinctive symptom.

All cases show some pathological alteration, and it has been difficult to separate the essential from the complicating. Very few cases are reported as having been operated upon and in these few instances the case reports are often incomplete. The position of the uterus has nothing to do with this symptom complex, as all positions have been noticed with apparent equal frequency. In the 29 cases which are being reviewed, laparotomy is recorded six times and five times a fibroid uterus was found. In the case of Whitelocke, this was first manifest at the second operation and not seen at the first laparotomy, while in the case which the writer operated upon, the tumor was very small and so situated as to be found only after opening the abdomen. In these six cases the ovaries were found affected six times. Five times both ovaries were diseased while in one case, only one was altered. Twice the affection is called advanced sclerosis while in the four others, extreme cystic degeneration was found. In only one case was a hydrosalpinx found. In this case the opposite tube was said to be thickened while in one other case one tube was thickened. In the remaining four cases the tubes were declared to be absolutely normal. In the writer's case 1, in addition to a freshly ruptured corpus luteum, the endometrium was found in a state characteristic of beginning menstruation. In two of the non-operated cases fibroids were diagnosed. I shall, however, not enter further into the detailed diagnosis of the other cases where confirmation by operation or autopsy was not made. Rosner's findings, however, though not confirmed by autopsy or operation are so definitely stated as to be of value. In 12 private patients, he found only one who had normal genitalia and one who had normal uterine dimensions, while all the others (10) had increased uterine dimensions which he has designated as diffuse pathologic hypertrophy. In ten he found increased sensitiveness, increased size, or prolapse of the ovaries. He found in no case a tubal swelling of any nature, and in none an exudate. To review the above pathology, the high percentage of fibroids among the operated cases is especially worthy of note while the increased volume among Rosner's cases is highly suggestive of fibroid disease. The advanced ovarian changes among both the

operated cases and those of Rosner's deserves reiteration.

Many theories have been offered as to the essential cause of the affection, some fantastic, others with more regard to the known physiology of the genitalia, but in general without support in the way of findings. Drennan ascribes the mittelschmerz to the escape of the non-fertilized ovum in the mucous discharge, the pain being due to expulsive efforts on the part of the uterus. No further comment is necessitated, nor is a detailed elaboration of this theory considered advisable. Addinsell, Giles and Bland-Sutton believed the symptom complex due to hydrops tubæ profluens. Giles explains the periodicity by assuming that the œdema consequent to menstruation closes up the uterine end of the tube. Fluid accumulates in the diseased tube and the subsequent efforts to the tube to expel its contents give rise to the pains. The pain ceases with the escape of the tubal contents and the appearance of a discharge from the vagina. In cases which present no discharge they assume that the tubes are small. Here we have a gross anatomical lesion which, if the essential cause, should be found in every operated case. Rosner found the tubes in his 12 cases free from swelling. In only one of the six operated cases was a hydrosalpinx found, while in four of them the tubes were pronounced perfectly normal. This robs the theory of its worth because a hydrosalpinx is not overlooked in an operation. The premises even were false inasmuch as the discharge may appear before the onset of pain and does not in the majority of cases usher in the subsidence of pain.

Küstner, Schroeder, and Heitzman claim its origin in endometritis. Acknowledging the possibility of microscopical departures from the normal appearance of the endometrium, this finding needs some further explanation to account for the periodicity. The strongest point against this theory is that curettement does not produce a cure though it has been performed often.

Croom, Palmer, and Marsh believe the disturbance is due to ovulation, though they have offered no anatomical findings in support of their theory. Croom explains it by assuming that the ovulation in these cases is asynchronous with menstruation and that the pain is due to the resistance met by the follicle in its effort to burst and release its ovum. The consideration of this theory necessitates a review of our knowledge concerning the relations existing between ovulation and menstruation.

Schaeffer in Veit's Handbuch der Gyn. (p. 19), quotes Girdwood's observation that in an autopsy on a girl of 18, dead of tuberculosis, who had menstruated just six times, six scars were found as evidence of six ovulations having occurred. Lindenthal in an article on the corpus luteum cites a similar finding of von Hyrtl where in a girl who had menstruated 8 times, 4 scars were found in each ovary, and he adds that Strassman, in a review of a number of cases from the literature, found, that the number of scars agreed with the number of menstruations.

That ovulation can occur independently of menstruation is not fully proved by the occurrence of pregnancies before the onset of menstruation, during lactation, or in other periods of menorrhœa, for it can be argued that had not pregnancy resulted, menstruation would have occurred.

That menstruation can result independently of ovulation is also a question for consideration. The simple statement that it has occurred after bilateral removal of the ovaries does not answer the question in the affirmative, since an accessory ovary, or a portion of an ovary remaining undisturbed, could ovulate. It is pretty generally accepted that menstruation is dependent in some way on ovulation. That each menstruation and ovulation have a fixed time relation to one another, however, is proved abundantly in the operating room not to be true. Bischoff, Kölliker, Reichert, and Williams have been able to find freshly ruptured corpora lutea in only three-fourths of the cases examined during menstruation. Leopold and Mironoff examined 42 pairs of ovaries from three to 30 days after the past period and found 30 corpora lutea agreeing in age with the last menstruation, but in 13 of these, evidences were such as to deduce that the next successive period would occur without ovulation, and in 12 cases no corpus luteum could be found for the last menstruation.

That in a given case ovulation occurs with a

periodicity is deduced by English as well as Oldham in observations made on ovarian hernias, where they found swelling of the ovaries occurring regularly some days before menstruation; that this was ovulation, however, is not proved. From these evidences, one must conclude that ovulation does not occur in every case with the same time relation to menstruation, and that the periodicity of ovulation is not proved.

What evidences have been offered by the advocates of this theory to show that periodic intermenstrual pain is due to painful ovulation, that ovulation occurs at this time? No operative findings have been offered, only that the pain is periodic, and, since the pain does not coincide with menstruation, then the only other periodic occurrence is assumed to be ovulation.

So far as ascertainable the author's case is the only one operated on during an attack, and the condition of the ovary noted, a recent corpus luteum was found. Rupture of the follicle had occurred some time before, yet the subsidence of pain had not been ushered in; so that resistance to ovulation could not have been the cause of the pain in this case. Could the pain have been due to an excessive hæmorrhage into the ruptured follicle? Such an occurrence in a hard, inelastic tissue might well produce pain. That under certain conditions a corpus luteum can produce pain is known from the occasional case of a large corpus luteum or a cyst of the corpus luteum in early uterine pregnancy operated on under the mistaken diagnosis of ectopic pregnancy. In the author's case, however, the pain began always in the right side and that side was tender to bimanual examination three times at intervals, yet the corpus luteum was on the opposite side. Where both ovaries are present, ovulation occurs most probably in them in rotation, yet in cases of periodic intermenstrual pain, the pain always begins in the same side. Rosner reports a case in which there were two intermenstrual attacks of pain a month; according to the ovulation theory, there would be in such a case two ovulations a month. Since the periodicity of the pain is the basis for this presumption, then the dysmenorrhœa of the variety described by so many as ovarian could with equal justification be ascribed to ovulation; the presence of mittelschmerz does not protect from a dysmenorrhœa of this character. With ovulation as an explanation, what is the cause for the leucorrhœal or bloody discharge? As final evidence that the pain in these cases is not dependent upon the process of ovulation, or upon any condition of the corpus luteum, is the fact that in case 3, described here, a corpus luteum was found during the period of the patient's greatest comfort, one week prior to the next expected attack of the periodic pain.

Brodier suggests that the trouble is due to an overstimulation or a periodic congestion of the uterus, while Bouilly expresses much the same thought in blaming it on a congestion of the internal genitalia and vasomotor disturbances in the ovary. Richelot has taken the anatomy into view and says the pain is due to the diffuse pathological hypertrophy of the uterus with sclerosis of the ovaries. Van der Velde has arranged curves for a large series of women according to temperature, pulse, and blood pressure, and finds that the mittelschmerz occurs where the curve is lowest, corresponding to the lowest blood pressure and temperature, paralysis of the blood pressure allowing a demonstrable congestion to occur. Rosner's opinion is a combination of the four preceding, and he thinks the essential pathology is a sclerosis of the uterus and ovaries, and the altered secretion causes a low curve in the wave with periodic intermenstrual pain as the product.

It could hardly be called accidental that in the six operated cases six pairs of markedly sclerotic and cystic ovaries and five fibromyomata of the uterus were found. It is not at all infrequent, especially among patients with such a pathology, to see the menstrual type change so, that a woman who previously was regular may begin menstruating every two weeks. Now, we have no evidence to show that ovulation is equally frequent, yet there must be some abnormal stimulus at work in these cases whether mechanical, chemical or nervous. Also not infrequently in such cases we see the periods alternate in the quantity of the discharge, so that one period will be sufficient while the next is scanty and painful. Such a case menstruating every two weeks might easily come under the classification of

mittelschmerz with a bloody discharge. One might say that here the impulse was too weak to cause a typical menstruation. If the impulse were still weaker the stimulation to the uterus might be sufficient only to produce a leucorrhœal discharge. In other words, in the writers' opinion, periodic intermenstrual pain is an insufficient or abortive attempt at menstruation, the pain being a dysmenorrhœa and the whole picture depending upon degenerative and sclerotic conditions in the ovaries and uterus. This theory would explain the finding of an endometrium typical of beginning menstruation in the case 1 operated on at the height of a attack of periodic intermenstrual pain.

In closing it would perhaps not be amiss to suggest that such cases should be studied more carefully than they have been in the past, and especially, that in all such cases as require operation that the time of an attack of pain be elected for the procedure, that a bit of endometrium be secured for microscopic examination and if a laparotomy be performed that the presence or absence of ripe or freshly bursted follicles be noted.

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# INTESTINAL PERFORATION IN TYPHOID FEVER, WITH SPECIAL REFERENCE TO TREATMENT[1]

## REPORT OF SEVEN CASES


BY CHARLES BAGLEY, JR., M. D., BALTIMORE, MARYLAND

Visiting Surgeon, Hebrew Hospital


INTESTINAL perforation in typhoid fever, though suggested by Leyden as early as 1884, as a serious surgical complication, and definitely determined to be amenable to surgical treatment by the successful operation of Mikulicz during the same year, has certainly not received sufficient attention and careful study from either the internist or the surgeon. Harte and Ashhurst (1) of Philadelphia, in 1903, almost twenty years after the first operation for this condition, were able to collect from the world's literature but 362 cases of typhoid perforation, where operation had been performed, with a mortality of 74.03 per cent. I have made a similar search of the literature from October 1, 1903, to December 31, 1909, a period of six years and three months, and have found only 265 cases reported as having been operated upon with a mortality of 55.09 per cent. When we consider the rapid strides made in other fields of surgery during this same period, the fact is only too evident that this condition has been neglected. The complication must not be

[1] Read before the Medical and Chirurgical Faculty of Maryland.

looked upon as a surgical rarity, as Osler (2) states that "from 25 to 33 per cent of all deaths from typhoid fever are due to perforation." In the United States alone in the year of 1900 over 35,000 deaths from typhoid fever were reported. It is therefore fair to assume that from 9,000 to 12,000 deaths occurred from perforation in the United States alone during the year of 1900. Again, if we recall the many cases of typhoid fever occurring in the city during the summer months and realize that from two to three per cent of all cases perforate, the number of cases of perforations would be appalling. In the Hebrew Hospital the per cent of perforations has been even larger, Dr. S. H. Long (3) having recently reported 76 cases of typhoid fever occurring in the wards from October 15, 1908, to December 31, 1909, and I will here report seven cases of perforation occurring in the same series, showing that 9.21 per cent of our cases of typhoid fever were complicated by intestinal perforation.

### SYMPTOMATOLOGY

As we do not possess one symptom which can be definitely depended upon, we must endeavor to observe the patient carefully from the beginning of the fever and attempt to derive benefit from some small danger signal which is almost certainly present during the beginning of the complication. Let it be clearly understood that perforation is the lesion we are to diagnose and that peritonitis is not to be allowed to advance to the point of easy recognition before some attempt is made to treat the perforation. It is indeed difficult to differentiate these conditions, as a local peritonitis usually begins immediately after the perforation has occurred, but if we are to expect better results from the surgeon, we must also expect the internist to make the diagnosis of perforation and not simply wait until the fall of temperature, rapid thready pulse, shallow respiration, and anxious expression demonstrate clearly that the patient is dying of a peritonitis. As the responsibility of the internist in the diagnosis of this condition is so great, he should receive equal credit with the surgeon in all cases successfully operated upon. In attempting to arrive at an early diagnosis, I am convinced that we must make greater use of the pre-perforative stage, outlined by Dr. Cushing (4). This will no doubt mean that some of the cases will be operated upon and no perforation found, but this procedure is our only means of giving these patients the benefit of the doubt, and is certainly the proper course to pursue. In our recent study of the literature, we found 16 cases thus treated with a mortality of 37.5 as compared with 265 cases, where perforation was found, with a mortality of 53.09 per cent, the mortality here being about 20 per cent less than the cases where perforation was actually found.

Pain is by far the most important guide to the complication, being present in over 95 per cent of the cases. The sudden onset is the characteristic feature of this symptom. Coming suddenly and frequently with unusual severity, the pain in a large percentage of the cases increases in intensity, but may disappear or become less troublesome to the patient a few minutes after the onset and cause no alarm for several hours, only to begin again with additional symptoms in a more alarming manner. The subsidence of pain in these cases may be due to the plugging up of the perforation by the omentum or other coils of small intestines and thereby checking the outflow of infected material; this relief only being temporary however, as the adhesions are soon broken loose, allowing the material to again flow into the cavity, thus the re-occurrence of the pain. This valuable symptom may be overlooked in patients with severe toxæmia, the sensorium being obtunded. We can then but hope to diagnose the resulting peritonitis as early as possible.

Tenderness on pressure over a very small area is our next most valuable sign. Alfred Brown calls attention to the fact that this area of tenderness changes with the position of the patient.

Rigidity occurring as a slight muscular resistance over a small area may be said to go hand in hand with tenderness. These two symptoms considered jointly offer a great deal of assistance in cases in which the perforation lies in close proximity to the peritoneum of the anterior or lateral abdominal wall, but may appear very late, if the perforation occurs toward the posterior wall of the abdomen or in

the pelvis. As the condition advances, the abdomen will become very tender, rigid, and fixed, the golden opportunity having been passed.

Pulse. Acceleration of the pulse may be noted during the initial pain, but the general rate for the first few hours is not to be depended upon.

Blood pressure. While sufficient work has not been done in this direction to warrant us drawing positive conclusions, this certainly offers a field for further investigation. The pressure undoubtedly rises as peritonitis progresses; an elevation of 15 points being noted in one of our own cases, while Dr. Crile (5) quotes four cases in which blood pressure was observed; a rise of 74 mm. being noted in one case.

The dipping crackle. This sign as described by Alfred Brown (6) should be carefully studied, though personally I have been rather disappointed in its use on account of the sound produced by the friction of the stethoscope over the abdominal wall, and the gurgling of the gaseous contents of the intestines.

Chill may occur rather early in the course of a few cases.

Vomiting may occur, but is more likely to give way to a feeling of nausea, until very late.

Leucocytes. The leucocyte count, as an aid to the diagnosis of perforation, may be mentioned, only to condemn it, as I am sure many cases have been allowed to become moribund while waiting for this, a positive evidence of peritonitis, to appear.

Dullness. As a large quantity of serous or seropurulent fluid is found within the abdominal cavity during almost every operation for perforation, this should be of value if carefully studied.

## DIAGNOSIS

The conditions with which this complication is likely to be confused may be divided into two groups; first those occurring within the abdominal cavity and requiring about the same treatment. These we will merely mention, but not attempt to discuss in this limited space.

Appendicitis.
Intussusception.
Peritonitis.
Perforation of gall-bladder
Rupture of mesentery gland.
Rupture of spleen.
Salpingitis.

Secondly, those conditions in which operative interference may do no good, and possibly harm.

Intestinal hæmorrhage.
Meningitis.
Pneumonia.
Pleurisy.
Retention of urine.
Thrombosis of one of the abdominal veins.
Tympanitis and constipation.

Intestinal hæmorrhage and perforation, both being indicative of severe ulceration, and being associated in about 10 per cent of the cases, are necessarily very difficult to differentiate. A careful watch upon the stool and estimation of the hæmoglobin will often tell the story.

Meningitis has been mentioned, as I found one case in the literature where this mistake was made; the abdominal symptoms of meningitis however, are only of secondary importance, and should be easily distinguished from those of perforations. Here, also a leucocytosis may be found as well as other symptoms of meningitis, such as Kernig's sign.

Pneumonia and pleurisy, occurring at the base of the lung, in close proximity to the diaphragm, frequently produce abdominal symptoms, and can only be detected by careful physical examination, leucocyte count, and a careful study of the pain, which usually sets in gradually in pneumonia and suddenly in perforation. The respiratory rate is much increased in pneumonia.

Retention of urine can be excluded by palpation and percussion over the lower portion of the abdomen and if necessary by passing a catheter.

The pain of thrombosis is likely to manifest itself gradually, may extend down the leg, and is most frequent on the left side, while perforation is usually on the right.

Tympanitis and constipation frequently go hand in hand, though the former may occur without any evidence of the latter. In the differentiation of constipation, the history of the previous course of the disease may be of value, while the pain is usually less severe than that of perforation, and more gradual in onset. The differentiation of tympanitis is certainly the most troublesome, occurring more frequently than any of the other conditions, requiring for its relief treatment, which will in all probability

enhance the condition of perforation, if present, and in itself so trivial as to make one regret greatly having exposed the patient to a serious operation, should this be the only condition present. Here again, however, the onset of pain is usually gradual but the distension greater than that usually found in the early stages of perforation, and not so prone to occur in the third week of the disease, as is noted in perforation. The therapeutic test may be necessary and seems to be justified, if carefully carried out, in the form of spirits of turpentine by mouth, in stupes, or very small enemata.

### TREATMENT

Under this head, we must consider that the most important step has been taken, when an early and correct diagnosis has been made. As the mortality rate of cases treated medically (that is, without operation) is so high, we are not justified in considering this a proper means of treatment. In our recent search of literature we found 18 cases thus treated, with but 4 recoveries, giving a mortality of 77.79 per cent. The treatment should begin from the time the complication is suspected, by placing the patient in the Fowler or exaggerated Fowler position, withholding morphia and other sedatives, and carefully watching and correctly interpreting the symptoms as they appear. As soon as a very suggestive or positive diagnosis is made, the operation should be performed. In the performance of the operation, a good surgeon and proper hospital surroundings are desirable. If the securing of either, however, means a delay, time should not be lost, but the best facilities available made use of. In conveying the patient, no matter what the distance, every effort should be made to retain the Fowler position. After reaching the operating room the table should be placed in the reverse Trendelenburg position, elevating the head, if possible to an angle of 45 degrees with the horizontal. The abdomen should then be carefully and rapidly prepared and right rectus incision made under cocaine, using Schleich's solution until the peritoneum is reached, which can readily be anæsthetized by the application of cotton pledgets, saturated with a 10 per cent solution of cocaine. When the cavity is opened, a very slight search of the lower portion of the ileum may be made, as the perforation is likely to be located in this portion of the bowel; if found, the perforation should be closed by purse string or Lembert suture, if not too friable. I do not believe a prolonged search for the perforation should be made; first, because this requires the giving of a general anæsthetic, and second, shock, produced by handling of the intestines, frequently proves fatal within a few hours. If the perforation is believed to be in the lower portion of the peritoneal cavity, the condition can well be taken care of by simply placing a sufficient number of drains in the pelvis and retaining the Fowler position. It is true that this renders it impossible to close the wound, but this difficulty is encountered in almost every case; only 10 of our 265 cases, collected from literature, being closed without drainage, with a mortality of 40 per cent. The drains may also be mentioned as a ready means of taking care of a second perforation occurring a few days after the first, which may not infrequently happen. The flushing of the cavity with a large quantity of various solutions has been largely given up, and cannot be too strongly condemned, as by this means a small amount of infected fluid within the pelvis may be easily disseminated through the entire cavity, thereby enhancing the absorption of infected material. The original incision in the abdominal wall having been made very small, may need one or two sutures, or may be entirely filled with drains.

### AFTER TREATMENT

An important step in the after treatment has been taken by the placing of the drains, believing that these drains will protect the patient from a fatal peritonitis, should a second perforation occur; you are therefore in a position to give them a most liberal, nourishing diet, realizing that the patient is to pass through a rather long period of constant strife against two serious maladies. Stimulants are given as indicated, but by far the most important part of the treatment consists in the watchful care of the nurse, to keep the patient constantly in the exaggerated Fowler position, preferably on a double inclined bed, specially designed for this purpose, and the giving of a proper

amount of nourishment, whether desired by the patient or not.

The following is a short summary of seven cases occurring in the wards of the Hebrew Hospital from October 15, 1908, to December 31, 1909. Of these cases, two were admitted to the hospital and considered to be in a moribund condition, one dying while being taken to the operating room immediately upon admission; the other was considered hopeless on admission, and operation, therefore, deemed inadvisable. The third case was extremely ill and delirious when admitted. The course of the disease after admission was rather tedious, followed by death one week later; autopsy revealing many perforations in the lower portion of the ileum. The fourth case was admitted to the hospital during the first week of the disease and presented the usual course until the fortieth day after admission, when perforation occurred. Operation was performed 15 hours later, death following within 38 hours.

The other three cases were operated upon and recovered.

CASE 1. H. P. G., male, age 35 years. Admitted May 17, 1909, in the service of Dr. R. Winslow. When admitted to the hospital the patient showed all symptoms of a general peritonitis which had been going on for 48 hours. He was taken to the etherizing room, but died just before entering the operating room.

Autopsy revealed a general peritonitis with three perforations, the abdomen containing a large amount of fluid and fæcal material.

CASE 2. F. L., male, age 23 years. Admitted December 8, 1908, in service of Dr. F. R. Smith. Patient had been suffering from typhoid fever for about three weeks and was slowly improving, when he was suddenly seized with a severe pain in the abdomen, which was followed by the usual symptoms of peritonitis. Was admitted to the hospital two days later with a temperature of 101°, pulse 145, respiration 50. Abdomen distended, patient delirious, pulse very weak, patient cold and clammy. As it was thought that the patient would die in a few hours, operation was deemed inadvisable. He was therefore allowed to remain in the ward until 14 hours after admission, when he died. At the autopsy, a general peritonitis with two perforations was found.

CASE 3. F. K., male, age 32 years. Admitted September 11, 1909, in the service of Dr. Beck. Family history negative. Present condition commenced three weeks before. Usual typhoid symptoms. At time of admission was delirious and very toxic. Physical examination, negative, except for enlarged spleen and increased liver dullness. Symptoms of toxæmia increased, died one week after admission, apparently of the toxæmia. Autopsy revealed many perforations in the lower part of the ileum with peritonitis.

CASE 4. H. B., male, age 30 years. Admitted November 9, 1909, in the service of Dr. Howard Kahn. Family and past history, negative. Present illness commenced one week before; headache, malaise, etc. Disease presented its usual course until after fortieth day of admission, when attention of the physician was called to the patient about two o'clock in the afternoon. Believing nothing serious was wrong, the patient seemingly doing well, one-eighth grain morphia was given. At 5 P. M. a medical consultation was held, when it was decided to await developments. At 8 P. M. a surgical consultation was held, the symptoms of perforation now becoming more evident. When a history was obtained from the patient of a sudden severe pain, at 9 A. M., 11 hours previous, the pain having disappeared after a few minutes, it was again decided to wait, and at 11 P. M. the patient's condition seemed serious and operation was decided upon. The abdomen was opened under cocaine, and a rather extensive peritonitis found, drains inserted, death following 38 hours later.

CASE 5. S. B., male, age 37 years. Admitted November 8, 1908, in the service of Dr. Bressler. The patient's wife and child had been suffering from typhoid fever, the child having died of the disease, and while attending the funeral he was seized at 2:30 P. M. with severe pain in the abdomen. Admitted to the hospital at 10 P. M. At the time of admission the abdomen was rigid, the early signs of peritonitis being present. Patient was removed to the operating room at once, anæsthetized with ether, a three inch incision made in the right rectus. The finger passed into the abdomen, the lower portion of the ileum pulled into view, revealing a large perforation from which fœcal matter was flowing. The intestine was very brittle, showing acute inflammation. As the area was large, it was necessary to resect about one and one-half inches of the bowel. An end to end anastomosis was done, drains placed in the abdomen, wound sutured, and the patient returned to bed in the Fowler position. Condition remained good until November 14, 1908, six days after the operation, when fæcal contents were noticed upon the drain, which we believe was due to a second perforation, followed on the 15th by hæmorrhage from the wound of about 300 cc. of blood, which was controlled by pressure. Fæcal material drained for about one week during which time patient was very ill. Recovery thereafter was rather rapid and the patient was discharged on January 6, 1909, two months after admission, in excellent condition.

CASE 6. C., female, age 17 years. Admitted September 30, 1909, in the services of Dr. F. R. Smith. Family history, negative. Past history: Eight months previous patient had rheumatism followed by dyspnœa, apparently due to heart complications. Patient entered hospital two weeks after first symptoms appeared. Physical examination revealed a bad heart with marked systolic murmur and irregular rhythm. Pulse rate evening of admission, 136; respiration, 37. Usual severe course until September 23d, 12 days after admis-

sion, 7:30 P. M., complained of severe pain in right iliac fossa. The head of the bed was elevated. At 10:30 P. M. abdominal rigidity was noted. September 24th, 1 A. M., tenderness and rigidity over lower abdomen. I was called in consultation at 2 A. M.; arrived at the hospital at 4:30 and operated immediately, as Dr. F. C. Bressler, other visiting surgeon, could not be secured. The incision was made under cocaine, and about three pints of straw colored fluid were evacuated. A glass drainage tube and three cigarette drains were placed in the pelvis; no search was made for the perforated area, as the patient's condition was very bad. The omentum was adherent near the brim of the pelvis on the right side. This is supposed to have been the seat of the perforation. As the incision was small, no sutures were required. Cultures of the fluid from the abdominal cavity showed pure cultures of colon bacilli. Operation required about 12 minutes. Patient was placed in exaggerated Fowler position. September 26th, pain in the right chest distinct pleuritic rub. Fæcal matter was noted on abdominal drain. September 27th, râles all over chest. Bowels moved. September 29th, condition improving. Improvement continued until November 6, 1909, when patient was discharged cured.

CASE 7. J. S., male, age 12 years. Admitted August 11, 1909, in the service of Dr. Hirsch. Patient entered the hospital two weeks after the initial symptoms. Disease ran a severe course. The patient was always restless and often delirious. August 19, 1909, 8 A. M., eight days after admission, the patient complained of pain in the right abdomen, which was followed in a couple of hours by rigidity of the right rectus muscle and slight distension. The temperature at 10:30 A. M. was 102.6°, at 11:30 A. M., 104.4°, 1:30 P.M., 103.4°. Pulse accelerated about ten beats during this time, and respiration was very much decreased. I was called in consultation at 2 P. M., and operated immediately, as Dr. J. W. Chambers, the visiting surgeon, could not be secured. Operation at 2:30 P. M., Schleich's solution and 10 per cent cocaine were used as an anæsthetic. Peritoneal cavity opened and a few whiffs of chloroform were given, 60 drops in all. The index finger and the thumb were passed into the abdominal cavity. The lower portion of the ileum was seen and carefully pulled into view. This portion was held in position while the index finger and the thumb of the other hand were passed about four inches higher up upon the ileum, exposing about four inches more, thus making eight inches in all of the ileum exposed. A small pin point perforation with sloughing edges was found. The perforation was closed with a small purse string suture, reinforced by one interrupted suture. Drainage tubes were then placed in the pelvis and the Fowler position continued. After 48 hours the patient's condition seemed unfavorable, pulse being weak; it was then noticed that only three ounces of water and eight ounces of albumen had been given since the operation. As the patient had been getting stimulants and salt solution by the bowel without good results, it was decided to be more liberal in the feeding, believing that the drains would take care of a second perforation should the condition occur from too liberal feeding. Within the next twenty-four hours the patient received water, one ounce; cocoa, six ounces; grape juice, two ounces; orange juice, two and one-half ounces; albumen, fourteen ounces, and seven eggs. During the next few days, the diet was varied with broth, ice cream, gelatin and milk, thirty-six ounces of the latter being taken on tenth day after operation. The body weight was recorded daily, beginning on sixth day after operation, when it was 56 pounds. It remained stationary until eleventh day after operation. There was then a loss of one and three-fourth pounds, but from this time on, a steady gain was noted until the day of discharge, when the body weight was 78¾ pounds.

The temperature after the operation ran a continued course of three days, gradually returning to normal until the 24th day, after operation, when a sudden rise was noted, which was the beginning of a typical relapse which continued for two weeks. No further trouble, however, was noted with the abdominal wound, and the patient was discharged eight weeks after operation in good condition.

In this series of seven cases, three died without surgical interference. The remaining four cases were operated upon, with but one death, giving a recovery rate of 75 per cent in cases operated upon.

In conclusion, I beg to thank the members of the visiting staff in whose services these cases occurred, for the privilege of studying them, as well as the medical house staff, Dr. Abrams and Long, for the early diagnosis of the two cases upon which I operated; and have no hesitancy in stating that these patients are alive to-day chiefly because an early diagnosis was made, rather than on account of anything that was done in the operating room.

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# THE CARE OF THE PUERPERAL WOMAN[1]

By IRVING H. EDDY, M. D., Chicago, Illinois
Instructor in Gynecology, College of Physicians and Surgeons (University of Illinois)

IT is not my purpose in presenting this paper to add anything new on the management of the puerperium, but rather to make an earnest plea for a more careful application of the measures at our disposal and to bring about better results of the so-called "physiological process of childbirth."

All will agree with me that it requires from six to eight weeks under the most favorable circumstances, before the uterus has regained its normal size, that a longer time is required for the various ligaments to be restored, and that the pelvic outlet never quite regains its normal tonicity. In considering the etiological factors of prolapse and displacement, we find that any condition which increases the weight of the pelvic organs or decreases the carrying power of their supports favors this much dreaded pathology. Nor is there any factor so important as childbirth.

Hence one of the essential points in the management is to keep these patients in a position most available in preventing these conditions, until nature has had time or nearly time at least to restore the tissues to a normal state. It is generally agreed that following laparotomy, the patient should be in bed nearly three weeks for the organs to recover their shock, regain their functions, and for the incision to heal sufficiently to prevent hernia; yet we have been willing to let our obstetrical cases out of bed in ten days, when conditions could not be more favorable for pelvic hernia, prolapse of the pelvic organs, chronic congestion and infection with their ultimate results, endometritis, salpingitis, cystic degeneration, adhesions, rectocele, cystocele, and a multitude of other pathological conditions, because some one has said that "rest in bed for so long a period makes our patients semi-invalids." In my judgment there never yet has been an invalid made of a mother by keeping her in bed too long, unless her attending physician has unwisely kept her in the dorsal position, while thousands and thousands of mothers have been made invalids through negligence on the part of their physicians, by letting them about doing household duties, when they must needs be in bed.

In a very able paper (N. Y. M. J., 1890, vol. 52, page 126), Dr. Wm. B. Wood called attention to the much needed rest, and says that "at least four weeks are required in other positions than the upright for the proper involution to occur, and the sagging that occurs when in the upright position separates the tears in the cervix; this being one of the important factors in subinvoluted conditions."

The human race is not perfectly adapted to the upright position, as demonstrated by the study of comparative anatomy, and only in the genupectoral position does the uterus have perfect support, hence the double necessity of guarding against these conditions.

Dr. Bacon (J. A. M. A., 1902, vol. 39, page 355) speaks of the much needed rest in bed during the relaxed condition of the abdominal walls, during the diminished intra-abdominal pressure, and disturbed circulation, and of their influence upon a general splanchnoptosis if the patient be allowed to be up; and the disadvantage of autointoxication, and its prevention through massage and exercise, the application of which he fully describes.

Dr. Holmes, in discussing the above paper, says it is not necessary to keep patients in bed two or three weeks, that no arbitrary rule should be followed, and calls attention to three important tests to determine the time of getting up, viz.: 1st. Tenseness of the abdominal walls. 2d. Lacerations of the perineum. 3d. Involuting process, character of the discharge, pain, tenderness, etc. Probably in the average primipara, we will find a degree of tenseness of the abdominal walls, but we never find it in so short a time in the multipara. Lacerations of the perineum cannot heal firmly in less than two weeks, and we must remember that we are not dealing with a simple perineorrhaphy, but an overstretched and paralyzed muscle that requires a much longer time to regain its normal tonicity. While the involution may be going on properly, yet clinical experience, borne out by the observations of Lusk, Williams, Peterson, and others, shows that the uterus at the end of the second week weighs three hundred and seventy-five gms., or in other words six times its normal size. With this brief review of the above tests I feel that Dr. Holmes will agree with me that his first statement is not consistent with the latter. During the first twenty-four hours, the patient should be kept in the dorsal position, to prevent air embolism. If such a condition really occurs, however, it is generally agreed that the cases of death during the puerperium ascribed by older writers to the entrance of air in the uterine sinuses was in reality due to infection of the bacillus ærogenes capsulatis.

After the first twenty-four hours I am much in

[1] For Discussion see Transactions of Chicago Gynecological Society.

favor of the right and left Sims' position, which affords the uterus a better opportunity of remaining forward and aids the return circulation. I use both positions, to give all the ligaments affected an equal chance for involution. After the first week the knee chest position should be insisted upon for use at short intervals, several times daily, and continued over a period of several weeks.

My first point then is that obstetrical patients should be kept in a suitable resting position until the organs are more nearly restored to a normal condition.

Lacerations. To me an extreme exhaustion most frequently due to hæmorrhage is the only contra-indication to immediate repair. Silkworm gut should always be used, as it is supportive as well as lasting, two features necessary to insure good results. I have seen a number of cases where catgut had been used, even a continuous suture, which absorbed in a short time and gave way before union had occurred. It also materially favors infection. In placing the sutures one should go deep enough to get well out into the levator ani muscle, and remember that swelling and œdema of the parts occur; consequently, the stitches should be tied loosely to secure the best result. Some writers state that the best time for repair is after the swelling and œdema disappear, but this affords too great an opportunity for infection of the parts to occur. The importance of care given these patients, as especially applied to lacerations, is summed up by Hirst (American Medicine, Phil., 1902, vol. 4, page 849) as follows: "If any one physician in general practice calculates the number of cases he sees in a limited time, of rectocele, of cystocele, of uterine retroflection, originating in the puerperium, of injured cervix, and all its consequences, including cancer, of prolapsus uteri following childbirth, of subinvolution and endometritis following abortion or labor, of the pelvic inflammations of puerperal infection, of splachnoptosis following diastasis of the recti muscles and coccygodynia; if he multiplies his experience by that of thousands of his colleagues in America, if he reflects that every one of these conditions represents the fault of a physician, that every one of them could have been prevented, or could have been cured without delay, he must be appalled by the thought that the medical profession itself, is responsible for five-sixth of the diseases of women as we see them to-day."

Repair of the cervix is not generally done at the time of delivery although strongly recommended by Hirst. I believe that much better healing of the cervix will be accomplished if the general principles of this paper are adhered to, and, that all the ill effects cannot be laid at the door of lacerations.

Toilet of the perineum. Before delivery one should make it a routine practice to shave his patient. This affords a much better opportunity for cleanliness and the prevention of sepsis.

External irrigation or sponging from above downward with lysol or bichloride followed with the sterile dressing are alone indicated, and under no circumstances should the douche be used during the first ten days of the normal puerperium. There is very little excuse for sepsis at the present time, as definite means of preventing it are at our disposal, and this condition should be unknown among our patients except for pre-existing infection which is extremely rare at the time of delivery compared to the frequency of infection found in the pelvic organs, and is probably explained, in part at least, by the enormous increase in the blood supply during the period of gestation, and to the development of opsonins.

Relative to the uterus, our first attention should be directed to the presence or absence of hæmorrhage, and if present should be controlled by removing membranes, placental tissue, massage by grasping the uterus as a cricket ball, ergot in some form, and if need be, the uterus packed with gauze, best accomplished with the least danger of sepsis through the use of the Holmes' packer.

Ulrich (Surg., Gyn. and Obst., 1906, vol. 3, p. 650) says, "The tamponing of the puerperal uterus immediately after labor and during the puerperium is a procedure of great importance and not appreciated by the average practitioner of midwifery and seldom by the specialist." I cannot approve of this procedure as a routine measure. In my experience hæmorrhage of an alarming nature is not a frequent condition, and we should realize that needless procedures are dangerous, to say the least.

The contraction, position, and involution should be carefully guarded from day to day, and the character and amount of the lochia determined, as a relaxed uterus associated with the disturbance of the lochia, pulse, and temperature, indicate strongly retention of placental tissue, membranes, blood clots, or infection. For the past two or three years, I have made it a routine practice to prescribe equal parts of ergot and hydrastis in from 40 min. to dram doses, three or four times daily, and am fully convinced of its virtue in keeping the uterus firmly contracted, preventing blood clots, decreasing the amount of blood to the organ, relieving "after pains," aiding drainage, and lessening the amount of lochia, all of which are valuable adjuncts to a proper involution.

If at the end of the second or third week, involution is not progressing satisfactorily, or the normal position maintained, measures should be instituted promptly to remedy this condition, for if there is ever a place in gynecology for palliative treatment, it is found at this time. The displacement, if there be one, should be corrected, and a gauze or wool tampon of ichthyol and glycerine or boroglyceride inserted, to aid in maintaining the normal position. Hot douches are of great benefit at this time if given properly, as the dorsal position is the only one suitable, and that as usually taken in the bathtub objectionable. I wish to call your attention to a simple douche board that can be made without expense and will be found of great service in every home.

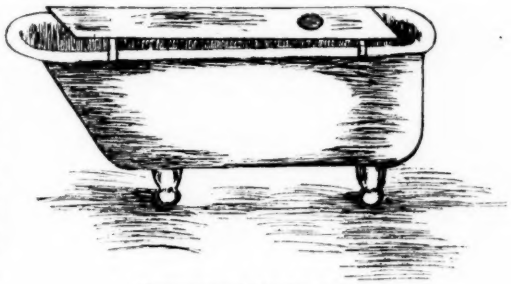

Illustration of douche board.

The board should be about fifteen inches wide four and one-half feet long, with an eight inch opening in a position suitable to the hips, which may be guarded by a small piece of rubber tubing encircling it to prevent the possibility of water escaping upward. The notched cross bars should be sufficient in length, to catch on the sides of the tub, and the upper one about three inches thicker than the lower, to afford sufficient fall. After the patient has passed the period of the possibility of infection, the plain hot water douche may be greatly facilitated by coupling the tube directly to the faucet, and the temperature and pressure regulated by means of the hot and cold water. In this manner the benefit of large quantities are afforded, and should one desire this may be followed by an antiseptic douche. After involution has been completed, if there is still a tendency to displacement, a properly fitted pessary should be inserted and the patient kept under careful surveillance.

The Sims' and knee chest positions should be especially urged in these cases. If the above measures fail and the uterus remain large and the cervical canal patulent, endometritis is present and a currettage is indicated.

Breast. The nipple should be hardened during the later months of pregnancy through frequent bathing with alcohol, and properly cleansed before and after each nursing, to prevent any possible infection that may necessitate the child's removal, for there is no one condition more essential in the proper involution of the uterus than the nursing of the child.

Should the breast show irritation or beginning infection it should immediately be put in a resting position, the ice-bag applied, the shield used, and a saline administered. Compound tincture of benzoin and silver nitrate will be of service in case of fissure. Should it become necessary from any cause to dry up the breast, it has been the custom to apply a firm binder, belladonna ointment, restrict the fluids, massage and administer salines. In a recent article in Surg., Gyn. and Obst., October, 1909, Henry J. Storrs quotes reports from the obstetrical department of Johns Hopkins Hospital and the private practices of Drs. Williams, Slemons, and Goldsbourgh, in which gratifying results have been obtained by the conservative method of leaving this condition entirely to nature. This broad experience dates over a period of four years and is worthy of our consideration.

Bowels and bladder. In no condition with which we have to deal is constipation more injurious than during the two months of the puerperium. The straining occasioned by this condition can do more toward bringing about displacement and prolapse through increased intra-abdominal pressure and drawing downward on the posterior vaginal wall, than any other factor engaged in their production. Sufficient laxative should be given to move the bowels regularly without straining and one that will not have a detrimental effect. After the initial dose of castor oil, I know of no drug that has a better effect than the effervescent sodium phosphate. Unless the patient is able to relieve herself without straining, an enema should be given. In this condition one can see the real benefit of massage and exercise as outlined by Dr. Bacon. I have found massage of the abdomen with a small iron ball rolled in the direction of the large bowel of special value. Electricity is an unquestionable aid in stimulating the circulation, toning the abdominal walls and viscera. Urination should be carefully guarded and the bladder examined for distension, but every means should be exhausted before resorting to the catheter, for once used it is difficult to overcome; however, in cases where its use is imperative, it should be done frequently enough to avoid the ill effects of an overdistended bladder.

The binder may be used for the first twenty-four

hours to assist in preventing hæmorrhage, after which time it should be interdicted, as it undoubtedly favors backward displacement. Williams says, "It cannot do harm after the tenth day, or after the uterus reaches the true pelvis."

Though it may not crowd the fundus backward, by direct pressure it must, of necessity increase intra-abdominal pressure, and by so doing must crowd the pelvic organs downwards; instead, where the abdominal muscles are relaxed they can be strengthened by having our patients lie on their backs and rise to a sitting posture several times daily without aid from the arms or hands, as recommended by Von Wild.

Diet. Generally speaking the diet should be liquid for the first two days, or until the bowels have been moved, after which there can be no objection to a liberal amount of good wholesome food. The pulse and temperature should be carefully observed for the first few days, and should more than a slight disturbance occur the cause determined.

"After pains." Since the adoption of ergot and hydrastis I have not had sufficient trouble with this symptom to demand any other medication, and I would caution the use of morphine as recommended by Williams, not only for its influence upon the patient, but by relaxing the uterus it favors hæmorrhage and clot formation. It goes without saying that plenty of fresh air and a light room have their important place, and that a good nurse agreeable to the patient is indispensable, for a state of mental quietude has a favorable influence upon the general functions. With infection eliminated, as it should be to-day, and the advancement of surgery that affords immediate repair with favorable results, it behooves us to institute a régime of treatment that cannot be reflected upon as being the cause of eighty per cent of diseases found in mothers at the present time.

With no better showing than this can we wonder at the fear with which women approach motherhood and at the problem of "race suicide" confronting us? In closing let me with all sincerity in the interests of the mother, who is dearest to the heart, make one more earnest plea in her behalf and close with the following conclusions.

1. That too early rising after labor is baneful to the patient, as is demonstrated by our class of clinical patients, who remain in bed but a short time.

2. That it is inconsistent to maintain that a longer period of rest will render our patients semi-invalids, and is proven by the fact that eighty per cent of the diseases found in women to-day are due to childbirth.

3. The genupectoral position being the only one in which the uterus has perfect support, calls for this line of treatment.

4. The immediate repair of lacerations is inducive to proper involution.

5. Sepsis should be unknown except for the cause given.

6. That packing the uterus as a routine measure especially in private practice, is not justified.

7. The use of ergot and hydrastis should be adopted as a routine measure, and opiates interdicted in the treatment of "after pains."

8. The opportune time for palliative treatment exists during the latter part of the puerperium.

9. Constipation should have especial attention, and measures instituted to prevent straining at stool.

10. The ill effects of the binder explained fully to the patient, and other instructions given for restoration of the normal figure.

# CÆSAREAN SECTION FOR IMPASSABLE CONTRACTION RING[1]

By ROBERT L. DICKINSON, M. D., Brooklyn, New York
Gynecologist to Brooklyn Hospital; Obstetrician-in-Chief to Methodist Episcopal Hospital; Consultant Gynecologist to St. Mary's Hospital, Jamaica, etc.

APART from considerations of contracted pelvis, or relative disproportion between passage and passenger, or blockade by scars or tumors, section for impassable contraction ring is warranted when the following conditions are present:

1. Child living and not definitely enfeebled or endangered by length of labor, long drainage of waters, or unskilled attempts at extraction.

2. Ring refusing to relax under morphia, or to yield to complete etherization, coupled with patient manual dilatation by a skilled obstetrician.

3. Mother in fair condition for a laparotomy and not infected.

4. Request by patient and husband that a somewhat increased risk to the mother be assumed for the sake of obtaining a living child, in lieu of embryotomy.

These indications are perfected if:

5. At a previous labor, in expert hands, this same condition of the contraction ring has caused loss of a child not unduly large.

The association of a rigid ring with other reasons for section is frequently present.

The following case seems to be the first instance of deliberate section for rigid ring in advance of the head. Dr. Watt's cases appear to be the earliest for neck constriction, and the three the first classical Cæsarean sections for contraction ring blockade.[2]

Case. In first labor, contraction ring obstruction, forceps, loss of child; in second labor, inability to dilate ring under anæsthesia, Cæsarean section, success.

A cultivated, healthy, and well nourished woman of 26, referred by Dr. E. W. Vietor, was delivered by me at Brooklyn Hospital in her first pregnancy, at the 32d week, with forceps. There was some general contraction of the pelvis, but not sufficient seriously to block the premature child. The obstructing ring did not relax under chloroform and the death of the child was due to the amount of traction necessitated, as far as I could determine. Two years later, at the 35th week, she fell into labor in my care. The pains ran, on an average, half-hourly for forty-eight hours, the cervix was soft, the membranes detached, the character of the contractions good, the head high, L. O. P. A thumb-thick circle admitting two fingers lay just above the plane of the pelvic brim, a measured two inches beyond the wider softened cervix, and girdling the entire circumference. No internal os apart from this upper circle could be located. The lower segment was relaxed, but not thinned appreciably. Morphia did not help, except to rest the patient. My attempts at dilatation under complete surgical anæsthesia failed. There was now some constant uterine contraction, but with each active pain the ring hardened markedly. No definite external transverse sulcus was determined by abdominal palpation. The membranes had ruptured a few hours previously. The general condition of mother and child was good. The parents were very desirous of a living child and elected section. The placenta was in front, and what seemed a large circular sinus bled freely. The ring retained its contraction after the emptying of the uterus. Both patients did well.

There are six cases of section for contraction ring reported in the available literature. All were in skilled hands. Duchamps' (10) operation saved the mother when in grave danger of rupture. In Gaulard's (13) first case and in that of Andrews every means to deliver past the ring, including embryotomy, failed, and section was a desperate last resort. Of five instances, in only one, Sinnetamby's (26), was the section undertaken of choice. Five were hysterectomies, and of the sixth (Foster's) I cannot procure details. Three of the six mothers died, one having had severe instrumentation for one and one-half hours preceding section, one operated on twenty-four hours after the water had drained and an arm prolapsed, and the third was an eclamptic. Two children survived, — the two that were living when the operation was done.

Duchamps (10, pages 1 and 5, Chéron) reports a case of Cæsarean section, in 1897, on a primipara with contracted pelvis, the child living, the head presenting, the waters nearly all drained away in the twenty-four hours of her labor. After incision the legs were found in the body of the uterus and an unsuspected resisting ring discovered, the child being im-

[2] The fourth Brooklyn case, Dr. Holden's, is added as the paper goes to press, p. 387.

[1] Read by title before the American Gynecological Society, Washington, D. C., May 4, 1910.

prisoned in the lower segment. The incision had to be extended through the ring posteriorly to extract the child. The uterus, split into two clam shells, was inverted through the vagina, then circled with rubber ligatures and the corpus cut off. Recovery of mother and child.

Gaulard (13) of Lille, in 1897, removed two tetanic uteri, in neglected transverse cases.[1]

A woman, thirty-six, had borne nine rather small children at term. In the eighth month the membranes ruptured easily, cord prolapsed, no pulsation, five franc contraction ring after twenty-four hours; L. Sc. P.; tetanic, wood-walled uterus. Impossible to dilate ring sufficiently or to perform version. Embryotomy very difficult because of distant location of fœtus, body removed, perforation of uterine wall in performing basiotripsy; impossible to secure head. Abdomen opened, head pushed through ring and vagina; hysterectomy; recovery. This case is in no sense a Cæsarean planned for ring dystocia, but exemplifies the difficulties caused by this obstruction, though it be in a multipara with a small child, where embryotomy is undertaken.

Gaulard (Bué, in Chéron, p. 248), in 1898, removed a septic uterus containing a putrid child, at the seventh month in a woman of twenty-two, who had had a living child at term; an arm was found prolapsed the day following spontaneous rupture of the waters, which rupture took place seven days before applying at the clinic. Mother in bad condition, impassable ring, rigid uterus. The Porro operation was done, with recovery.

Sinnetamby (26) in 1905, did a hysterectomy for contraction ring obstruction with a transverse presentation. This case is the earliest claim to deliberate choice of abdominal operation for impassable contraction ring with living child that I can find, but it was a hysterectomy. The patient was thirty; she had been in labor three days when brought to hospital; fifth child; previous labors uncomplicated; membranes ruptured for twenty-four hours, prolapse of an arm followed. Vaginal examination showed cervix and lower segment hanging loosely below retraction ring, which firmly gripped right arm above shoulder. It was impossible to insert finger between prolapsed arm and the retraction ring. Cæsarean hysterectomy was performed. Child, in a state of asphyxia, was resuscitated after prolonged artificial respiration. Woman died on the fourth day, thirty-four hours after operation. Post-mortem showed all organs normal except slight congestion of lungs and kidneys. Little or no tonic contraction of uterus was noted, and no obstruction except retraction ring.

Andrews (1), in 1906, in a case of head presentation, opened the abdomen because of failure to deliver the body after prolonged forceps tractions and cephalotripsy. Patient, thirty-eight, never had a living child; several miscarriages and still-births without difficulty. Last period forty-four weeks before labor began. Labor two and a half days before first observation. Child in first vertex position. Os fully dilated. Head bulging into brim; pelvis appeared roomy. Head soft, foul discharge. Axis traction forceps used, but head wouldn't budge. Attempted craniotomy removal, then cephalotripsy, face came away without skull. Various parts were removed. Every instrument used for one and one-half hours to no avail. A deep furrow felt on anterior uterine wall; finally abdomen was opened. Patient rallied fairly well at first but died twenty-eight hours after operation. Post-mortem showed stomach and intestines distended. Peritoneum had lost luster and was injected; lungs congested and œdematous. True conjugate four inches. Height of R. R. on right side denoted so great elongation of lower segment that the risk of rupture seemed grave if things were left to nature. There was, however, no great distension of lower segment. Frozen section was made one-fourth hour after removal. Fœtal contents weighed six and one-half pounds, and this after removal of head, cervical vertebræ, thoracic viscera, abdominal contents, both arms, and one leg. A distinct ridge was seen running obliquely upwards from left to right. On the right side of uterus the termination of ridge was at least three inches higher than on the left. Where ridge joins uterine wall on right side, section of wall showed an abrupt alteration in thickness, and there can be little doubt that this spot marked the transition from the upper to

[1] See Bué; Memoires de l'acad. de Med., July, 1897; Nord Medical, October 15, 1897. See also Chéron, p. 246.

the lower uterine segment. In the specimen there was no relation between peritoneal reflection and the retraction ring. Most frequently the retraction ring presents its most marked obliquity in cases of transverse "lie," and this is easily understood if the asymmetry of such uteri be considered. "This specimen suggests that the cause of the condition is dependent entirely on the position and relation of fœtal parts occupying the lower uterine pole and that by firm and rigid molding the ring is formed. The ridge corresponds accurately to the groove between the fœtal thorax and flexed thigh. From an examination of the specimen one would think that only a slight amount of traction would have been necessary to effect delivery. Did the ridge of the uterine wall fitting into the fœtal groove act as an actual mechanical obstruction to delivery, holding the contents of the upper part of uterine cavity as in a vise?"

The cases reported by T. A. Foster (12) of Portland, Me., referred to in the literature without references, I have been unable to get hold of in spite of careful search. Dr. Foster's son could give no assistance. Dr. R. B. West (32) refers, in 1903, to Dr. Foster's case as having been complicated by eclampsia, the result of Bright's disease. The retraction ring was a little below the middle of the uterine body, above the internal os. Patient lived six hours. Dr. Beeson (3), in 1904, refers to a Cæsarean operation undertaken by Dr. Foster "after other means failed."

A review of the literature of the last ten years on the subject of Bandl's ring reveals about thirty available articles published in French, German, and English, and perhaps half a dozen more in other languages. Amongst these there are but four cases of Cæsarean section reported. In countless papers written during the same period concerning the Cæsarean operation, we find only four authors who mention the retraction ring as one of the indications for that operation, De Bovis (8), Dixon (9), Reynolds (21), Newell (17). The opponents strike no uncertain note.

Demelin (7) is positive. Forceps and version, he holds, are both often impossible. Should we then think of Cæsarean section? No, for many reasons. The woman is unfit to stand hysterectomy on account of the length of her labor and the attempts already made. Above all, if there have been many trials and difficult ones, the child will doubtless be already dead, in which case the question is simple. "It suffices to employ basiotripsy, always easy and always certain."

As an answer to this I draw attention to the grevious failures in two of the cases quoted above. But I admit that the occasion rarely presents itself wherein a skilful hand, with the patient under complete etherization, fails to bring a fœtus in sections through a rigid ring. The point we make is that to the uninfected, unmutilated mother with a strong child and with waters not long lost, we are able to offer clean surgery and a baby instead of embryotomy.

Chéron (5) has given more study than anyone else to the subject. On account of the great infantile mortality, he says, some authors are inclined to urge the claim of the Cæsarean operation in cases of strong annular contraction. "We are not able to subscribe to such operative measures, which we do not believe to be justified in any case." Laparotomy should never be practiced unless one is convinced by preliminary trials of forceps and version, that it is impossible to extract a living child; and such intervention made after various vaginal maneuvers will certainly result unfavorably. There should, however, be no question of undertaking this operation lightly without first attempting the measures which will expose the patient to the smallest risks. "To save the life of the child we are not justified in the employment of violent means."

But these considerations were expressed years ago. The attitude of obstetricians has changed concerning Cæsarean section, and the indications for its employment. Could it be better expressed than in these two opposing French views?

"L'operation Césarienne est une inspiration de sauvage qui coupe l'arbre pour avoir le fruit."

"L'operation Césarienne conservative est, au vingtieme siècle, l'inspiration audacieuse de la chirurgie qui ouvre les entrailles de l'arbre de la vie pour sauver son fruit et l'existence de sa matrice."

"The Cæsarean operation is the impulse of a savage who cuts down the tree to get the fruit."

"The conservative Cæsarean operation in this twentieth century, is the audacious inspiration of surgery which opens the heart of the tree of life to save both its fruit and its core."

Dr. C. H. Dixon (9) tabulates the relative indications when Cæsarean section enters into competition with craniotomy and symphysiotomy: (1) When there is moderate degree of contraction; (2) forceps on a movable head ineffectual; (3) if head shows no sign of descent after an hour of second stage; (4) rigidity of os extending as high as Bandl's ring.

De Bovis (8) believes it is better in vertex presentation to have recourse to Cæsarean section after trying what can be done with narcosis pushed as far as possible.

Dr. Edward Reynolds (22) in describing the labors of those whom he terms the obstetrically worse equipped, says: Pains are irregular and excessively painful; the os dilates slowly; the cervix is spasmodically rigid; they usually relax under ether and recontract when anæsthesia is removed. In such cases nervous exhaustion sets in early, and if the hand is passed into the uterus during even the first stage it will usually find one or more zones at which the uterus clasps the child in a spasmodic constriction ring.

"During many years observation I grew to believe that the early appearance of constriction ring is an almost invariable accompaniment of even the first stage in the restricted class of unfavorable cases of which I am writing. If parturition is unopposed by any mechanical obstacle except rigidity of soft parts, the majority of cases will struggle through to natural delivery, but such deliveries are by no means favorable in their remote results, whether effected by nature or forceps. They are usually accompanied by lacerations and followed by neurasthenia. But the peculiar unfitness of these patients is for labor; they can endure abdominal operations as well as anyone. They are therefore suited to primary, not secondary, Cæsarean section."

Dr. Franklin Newell (17) writes very recently, the question has come to be, not, is Cæsarean section absolutely necessary, but it is not safer than other operative measures of delivery in doubtful cases? Cæsarean section as compared with other methods offers, at the time of election, no greater risk to the mother than a conservative high forceps or version, and a greatly increased chance for the child. In secondary cases the only thing that justifies it is for the mother to know that it offers a better chance for the child.

In conclusion, I may reiterate that the conditions calling for section which were specified in the beginning of this paper are relatively infrequent, but that where they exist the certainty of death of the child by difficult forceps or version, and the probability of extensive damage to the birth canal by crushing and cutting up the fœtus, render section preferable. It is remarkable that such a well recognized cause of dystocia, accompanied by so high a maternal death rate when treated by the usual procedures, should so persistently escape notice as an indication for the Cæsarean operation.

### THE DIFFICULTY IN DIAGNOSIS AND THE GRAVITY IN PROGNOSIS IN PRONOUNCED INSTANCES OF RETRACTION

The story of Bandl's ring began more than ninety years ago and continued fifty years before it acquired definite form and the dignity of a proper name. Since then this obstruction has inspired a more or less fluctuating interest, and the literature — here brought up to date from the time of Chéron's complete review in 1899 — reveals a paucity rather than a profusion of comment. This scarcity of reported cases never fails to impress those who take up the study of retraction ring dystocia, and gives to their observations the naive complacency of discoveries. And even now the debate goes on as to what the ring really is. Veit, for instance, declared as recently as ten years ago, that it is nothing more than a contracting internal os disappearing under chloroform, while the French school, that has done most work to clear the way towards a solution of the problem, recognizes as an entity an isolated girdle well above the cervical canal. This question of anatomy may well be one of merely academic interest, and will not detain the

reader of this paper, but there can be no doubt of the present clinical necessity of a clear formulation or pronouncement concerning the import, diagnosis, and treatment of this condition, not only in the mind of the practicing obstetrician, but in that of the author of the text-book. A summary of the writer's views, based on research and on personal experience, wlll be found at the end of the article.

### ETIOLOGY

Contracted pelvis, pelvic growths, rigidity of the cervix, intensity of contraction, premature rupture of membranes, length of labor, uterine inertia, and any condition interfering with serous infiltration of the structure of the lower uterine segment — these are all predisposing causes.

Primiparity or multiparity makes no difference. Vertex presentation does not predispose.[1] Mismanagement may be a prime factor. Everything that increases intensity of contraction exaggerates retraction, ergot, for instance, or bag dilators. Budin especially insists on the large part dilators play in the etiology of the retraction of Bandl's ring. In this respect he thinks balloon dilators are much more apt to promote annular contraction than conical dilators.

Chéron (5) warns that a tendency on the part of the uterus to remain retracted may be an indication of the existence of annular contraction. "If we studied more carefully the modifications of the uterus in the course of labor we might be able to take preventive measures. The antepartum hour-glass contraction might cease to be a clinical surprise and become an expected complication which could be attacked with therapeutic resources. . . . It is always useful, unfortunately often impossible, to know how the uterine muscle has acted in previous labors."

G. Martin, of Stuttgart (16), made a clinical study of fifty normal labors. "In many women, primigravidæ and multigravidæ, two or three weeks before term, the retraction ring is indicated by a low ridge or offset (Absatz) differentiated by its resistance and peripheral to Müller's ring. Ordinarily its distance from Müller's ring is inversely as the length of the cervical canal. With a cervical canal of 3 cm. it averages 3–4 cm." The measurements are taken along the middle finger passed into the uterus. [Chéron (5) thought he could palpate a projecting band separating the body of the uterus from the lower segment in many normal pregnancies.] "In delivery the retraction ring is palpable in all those women with whom it is possible to push the finger past the presenting part, more particularly at the beginning of a pain. Here the wall of the lower uterine segment may be easily lifted from the ovum so that the finger tip comes up against the hard finger-thick projection. At the height of the pain there is found, instead of a ring, a flat hard thickening of the wall, tapering upward, which evidently is the ring pulled downward by the tension in the birth canal. Early in the labor the ring stands at the inlet; after long activity, one to two finger breadths above. The distance from the external os remains the same, 6–7 cm." Martin concludes that "the lower boundary of the active muscle of the uterine wall is the retraction ring. It is neither occasional nor is it the return of repeated or constant cramp fighting an obstruction. It is a physiological occurrence resulting from normal activity. If the isthmus constitutes the anatomical internal os the lower uterine segment has its origin every time in the inner layer and from the cervix."

Rossa (24) credits the French with having drawn attention to the hitherto rarely observed dystocias due to the contraction ring, yet in having laid so much stress on the ring as to have neglected to note the condition of the uterine muscle at the same time. The temporary spasm has an important influence on the mechanism. For the occurrence of the phenomenon particular circumstances are required which are found irrespective of the contraction ring, namely, lessened interior resistance at this location with lowered excentric tug of the uterine muscle.

How does the contraction ring behave, once having become firmly and closely set? Does the impasse remain or does it yield? Can or cannot the circular constriction act in opposition to the rest of the musculature? Rossa

[1] Here figures may be misleading. Observations show more cases of retraction in vertex than in other presentations, but that is only, Chéron (5) believes, because it is always the most frequent. Normally, vertex presentation occurs in 95 per cent of cases, while in our statistics of cases of retraction it occurs in only 58 per cent.

holds that we can differentiate three kinds of activity in the contraction ring.

1. At various times during delivery an hour-glass contraction (Einschnürung) developing during particular pains and in the further course of the labor entirely disappearing.

2. In combination with tetanus uteri as an unbroken persistent narrowing, i. e., true *contraction, in tetanus.*

3. After notable shrinkage of the cavity of the corpus uteri, that is, in the later stages of labor, with shortening and thickening of the entire wall, the contraction ring is found as a moderately persistent hour-glass, the narrowing increased with each pain; then we have *relative contraction.* This is not vicious, like tetanus, but a normal body-muscle action.

If there seems to be a contraction with the uterine body relaxed, which would seem to contradict the above, it is late in labor,when the muscle above never lets go entirely. Whether it yields or not depends on which is stronger — the driving power above, or the spasm below. There is no necessary relation between size of contraction rings and prognosis of delay due to obstruction. *The worst cases are the "relative contractions" late in labor,* the earlier ones seem of little significance. *Relative contraction does not yield to narcosis.* "Then there is nothing to do but to undertake a mechanical widening of the ring or to reckon with the continuing contraction and initiate an operative attack different from the one proposed." Here embryotomies come into play.

"In certain cases the obstruction is too narrow, or narcotics do not relax it, then dilatation of the ring is to be tried. The need occurs rarely. In the first class, early in labor, the ring takes care of itself. The second class, tetanus, is to be treated for tonic spasm, by avoiding the irritation of interference and examination, and by resort to morphine and anæsthesia, which will probably correct them. Failing, mechanical enlargement is required. In relative contraction (contracture) first, wait; next, try to reduce by narcotics; but when drug anæsthesia is not permissible, or there lacks time to get the full relaxing effect, and yet prompt action is demanded, then dilatation is indicated. Complete and lasting dilatation is not required, nor is it feasible. Balloons and bags are out of the question, since they foster narrowing of the contraction ring. The manual method is to be used. Two fingers, the half or the whole hand suffice, as in version or in freeing the placenta; or the pushing aside of part of the circle, as in the presence of the ring-grip on the shoulders or after-coming head. By which means it may be noted that in the presence of the contraction ring an extreme overstretching of the lower uterine segment may be present without a high location of the contraction ring necessarily pointing to this dangerous thinning, and the greatest care will be required not to rupture the uterus (which happened in Rossa's own case). Rossa appends a good brief literature.

Veit (31) flatly maintains that he knows "no cases wherein the ring draws itself together in cramp in advance of the child, thus entirely held back." The "ring" he believes to be a rigid undilated internal os, and that the muscle of the body of the uterus is in these cases relaxed. He does not think that spasm or contraction of Bandl's ring occurs except in the presence of contraction of the entire body of the uterus (though he admits this takes place as a passing stage of a peristaltic wave). Narcotics and time are his remedies. Stretching, he says, is not feasible during the spasm and not necessary between spasm or after spasm has passed.

Among the best authors there is some doubt expressed whether isolated contraction ever takes place. Playfair never saw a case. Hirst waives explanation. Williams thinks the condition is probably a rigid internal os. Hosmer calls it the same.

### DIAGNOSIS

It is often possible to locate the contraction ring externally. In abnormally severe labors the difference in thickness between the contraction ring and the constantly thinning and elongating lower segment becomes palpable and the boundary becomes visible as an obtuse angle under the belly wall between navel and pubes. In cases where the lower segment is relaxed and the ring coincides with a hollow in the child's body, we may feel, on the outside, a deep sulcus, and, within the uterus, a sharp

ridge. Before rupture of the membranes this diagnosis cannot be established by internal examination when the waters are large in amount. By vaginal examination only can the majority of instances be detected, and then the hand must often pass beyond the presenting part. Practically, an unexplained impossibility to deliver will start a search that will locate the ring. The details will be taken up below.

LOCATION

In normal labors the contraction ring is at the level of the inlet; after long activity one or two finger breadths above. The distance from the external os is 6 to 7 cm. ($2\frac{1}{4}$ to $2\frac{3}{4}$ inches). In abnormally great obstruction, whether in the soft parts, pelvis, or child, the contraction ring climbs higher as the hollow muscular organ lessens in size and its wall thickens (Martin, 16). The ring of Bandl is found 7 to 9 cm. above the external os, while the internal os is 4 to 5 cm., says Demelin (7). The height of the contraction ring is ordinarily half way between the symphysis and umbilicus, but increases and becomes much higher than normal when the contractility of the uterus is greater than normal. Hofmeier measured the lower segment and found it to be 18 to 20 cm. In many cases the contraction ring has been found as high as the umbilicus.

With relation to the child, the constriction may exist as follows:—

A. Ring beneath fœtus, in either 1, head; 2, breech, or 3, transverse presentations.

B. Ring circles body:—
1. Head presentations, usually about neck, but may grasp pelvis (West's case) or come below arms (Studdiford's section).
2. Breech presentations, neck (Smellie); body, thighs (De Bovis' case).
3. Transverse; neck, armpit, groin.
4. Twins; incarceration of second child (Smyly).

CLINICAL PICTURE, DRAWN FROM DEMELIN (7) AND CHÉRON (5)

When labor has proceeded for some time, say two hours, when the cervix is soft and dilated, when the pelvis is normal, flush and no obstacles exist in the way of tumors, and yet no progress is made, we may begin to suspect the presence of annular contraction.

If the lower segment is empty the hand feels its way through a long canal before coming to the head, which is always high. The state of the lower segment is variable. Sometimes its walls are so contracted as scarcely to admit the hand, sometimes they are soft and flaccid. The ring is felt just below the vertex like a second internal os. But no confusion need really exist if we keep the relative heights in mind. If the contractions are exaggerated, the head is drawn higher and higher, farther and farther from the external os, which remains supple. Pains proceed, but the child is not expelled. The membranes may be ruptured or they may form a voluminous bag of waters filling the cervix and lower segment and extending as far as the vulva.

The ring acts in two ways: It either retains the fœtus in the uterine body, leaving the cervix and lower segment empty; or else it encircles a part of the fœtus, usually the neck, the head swinging like a pendulum in the lower segment while the trunk is held in the body of the uterus. When the lower segment contains a large fœtal part, the head for instance, the pains continue, exhausting and wearing out the woman. When the lower segment is empty contractions cease after a while. The cessation of pain and the height of the fœtus make us suspect uterine rupture, but this suspicion is not confirmed by the state of the patient. Indeed, this accident is not apt to happen when the fœtus is in the upper segment. But this does not imply that there is not the greatest cause for solicitude. Very often the child dies.

It happens frequently that the cause of obstruction is only recognized after an application of forceps has been made, and it is only after repeated failure of traction that the operator thinks of introducing his hand into the body of the uterus. Nevertheless, he should suspect the cause after the first failure of traction. The uterus is always drawn up wholly from below and the cervix is drawn to the vulva. Also the forceps have a tendency to slip in spite of the best of holds.

In other cases it is only after the hand is passed in for the sake of practicing version

and is arrested by the contraction ring, that its presence is suspected.

Such considerations show that as soon as it is demonstrated that labor cannot terminate spontaneously, and the fœtus, whatever its presentation, remains at the superior strait without engaging, if no appreciable cause of dystocia exists, we should as systematically inquire into the condition of the region of Bandl's ring as we would into the condition of the pelvis. Perhaps then we should know whether the retraction of the ring was as rare a phenomenon as it is generally believed to be.

Chéron speaks of three cases where the ring was not relaxed after death. Schatz insists that most stable brow presentations are caused by cramp of the inner womb mouth, or contraction ring, "as the Schroeder school names this spot."

### MORTALITY

The maternal mortality is very high. In marked degrees of obstruction it runs above 33 per cent. In moderate degrees of contracture, in cases well handled, it is nil. In the seventy-four cases in the literature fourteen mothers died. In seventeen cases of my own I lost no mother, but this list includes some instances of the less tenacious blockades. The difference in results is due to reasonably early recognition. The three factors of safety are early diagnosis, aseptic reconnaissance and attack, and obstetric sense in the choice of means and in the duration of drag in trying to run the blockade. The head cases show a mortality more than double that of other presentations. To my mind the reason for this is because these cases present the more difficult problems in diagnosis — the difficulty of reaching beyond the head to find the ring and the fiercer strangle-hold of the ring caused by the delay. Modern methods have failed to better our results, for in the last eleven years thirteen mothers died among the seventeen cases found.

The infant mortality is equally high. It reaches 50 per cent in the cases reported in the literature. It is higher in other presentations than in head-first cases, but the number of reports is too small to make any deductions of value which are based on these figures.

TABLE I. MORTALITY IN CONTRACTION RING DYSTOCIA

| | Head Presentations | | | Other Presentations | | |
|---|---|---|---|---|---|---|
| | Cases | Mothers died | Children died | Cases | Mothers died | Children died |
| Chéron before 1899 | 33 | 6 | 12 | 24 | 2 | 14 |
| Contracture and tetany of ring reported since 1899 | 13 | 4 | 10 | 4 | 2 | 3 |
| | 46 | 10 | 22 | 28 | 4 | 17 |
| | .. | .. | .. | 46 | 10 | 22 |
| Totals | .. | .. | .. | 74 | 14 | 39 |
| Author's cases, including moderate degrees of contraction | 17 | .. | 1 | 2 | .. | 1 |

TABLE II. MORTALITY IN CONTRACTION RING CASES UNDER OPERATIVE MEASURES. REPORTED BY CHÉRON

| | Cases | Mothers died | Children died |
|---|---|---|---|
| Version | 20 | 1 | 6 |
| Forceps | 7 | .. | .. |
| Forceps and version | 5 | 3 | 1 |
| Embryotomy, forceps and version impossible | 15 | 2 | 15 |

### TREATMENT

The procedures available are:

Relaxation by rest;
  by morphia;
  by anæsthesia to surgical degree.
Dilatation by hand;
  by bags;
  by traction;
    in head presentations, by forceps;
    in breech presentations, on groin or foot;
    in transverse presentations, by version.
  by incision of ring (not employed).
Embryotomy, when dilatation and traction fail.
Cæsarean section, without removal of uterus;
  with removal of uterus.

Relaxation is to be attempted in all cases. Morphia carries some dangers to the child in full doses. Ether relaxes more fully than chloroform.

Manual dilatation under anæsthesia is our main resource, except with heads fully filling the pelvis. Bags endanger further dilatation of a lower uterine segment that is already thinned, and are usually frowned upon. They

are not applicable to cases where the collar is filled with fœtal parts, but only to a low contracture in advance of a head, when prolonged dilatation paralyzes the hand. Incision is usually barred by the height of the ring, its distance from the vulva, and the danger of hæmorrhage at a point so far beyond ready access and control. I find no record of trial of incision of the barrier. Forceps are adapted to most head cases, but the fœtal heart needs watching, as all the power applied to the obstructing collar is via the child's neck. To forceps on head-last cases with neck constriction this objection does not apply. Embryotomy has a considerable field in the worst contracture or tetany in those instances not amenable to the foregoing. Cæsarean section has a very narrow but well-defined place, which has been specified, both at the beginning and end of this paper.

### OPERATIVE MEASURES

It would not be excusable to prolong this paper to enumerate some of the operative hardships encountered by good workmen, if it were not that, in ignorance of these gloomy results, the ordinary obstetrician jumps to the conclusion that, provided the child's interest is entirely set aside, any fœtus can be gotten out without undue trouble, through judicious persistent traction, by means of forceps, version or embryotomy, with reasonable safety to the mother.

This is not so. With well-marked contraction one-third of the mothers have died.

Nor are well-defined contractures and tetany of the ring readily overcome, as the following sample experiences demonstrate.

### FORCEPS

The application of forceps, Demelin says, (7) is very difficult, on account of the height of the head in the superior strait, and because they slip. Moreover, traction drags down the whole uterus with the head, and as the head descends we realize that the uterus is fitted like a glove about the fœtus and that they cannot be separated from each other. Concerning forceps use in obstetrics, he lays down the principle that the occipito-frontal application is bad in most cases, but as this grip slips infinitely less easily than others, he advises it without hesitation where the shoulders are gripped, the head mobile, and the child living. If forceps are applied, says Beeson (3), a pull upon the head ends seriously. The prognosis is not encouraging. He recognized the condition by passing his hand in beyond the head, in a primipara of sixteen, after thirty-five hours' labor. The head, movable above the brim, receded with each pain, the girdle, five inches from the external os, grasping the shoulders. After extraction by forceps, this child lived. Jacquemier (see Chéron) drew attention to the fact that dilatation of the collar by means of the pull of forceps, puts all the strain of the work on the child's neck, which is often fatal to the fœtus. Stewart (27) reports a forceps extraction of great difficulty which was fatal to the child, in a primipara, the obstruction being a rigid contraction ring five inches from the external os, holding back the shoulders. The head was freely movable. The ring could not be passed by the hand. The child was living when the idea of Cæsarean section was taken up, but it was abandoned because of the earlier forceps attempts and the previous useless cervix incision. Whitacre reports two forceps extractions with soft and dilated cervix and rigid ring in O. P. cases, where the obstruction gradually relaxed after three-quarters of an hour of hard work, mothers and children recovering. Cotret (6), in a primipara, with waters gone for over fifteen hours, decided against a Cæsarean section. Forceps failed, the shoulders gripped by the ring. He dilated by hand, turned, applied forceps to the aftercoming head to pass the ring, and lost the child. Watt's first case was a failure of forceps in good hands before coming to him. With the second patient not even axis traction forceps would avail.

Forceps extraction, however, is a valuable resource, successful in all head cases but those presenting high degrees of contracture or tetany. In every labor, however ordinary in appearance, when subjected to forceps delivery the head not advancing, and in the absence of definite obstruction by pelvis, cervix or pelvic floor (or relative disproportion), the ring as a cause must be borne in mind.

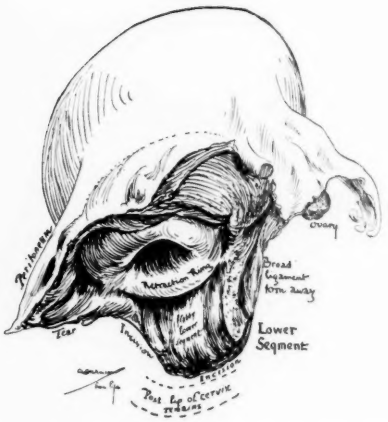


Fig. 1. An actual retraction ring, drawn from life immediately on removal by supervaginal hysterectomy. It is here presented to indicate the thickness and resisting power of the collar, before the occurrence of that post-mortem relaxation which is seen in frozen sections.

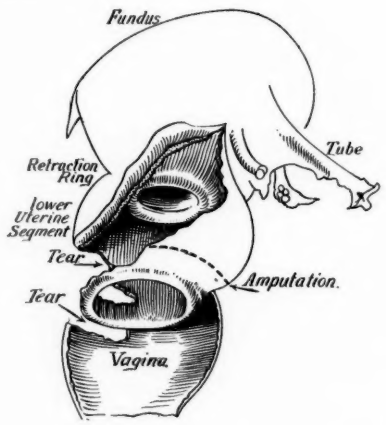


Fig. 2. A case of ruptured uterus operated on by Dr. R. H. Pomeroy at Brooklyn Hospital, in which the bulk of the child had occupied the lower segment, and then burst into the abdominal cavity through a long diagonal tear.

### VERSION

Version is applicable to transverse cases chiefly. It, also, is difficult, and the thinning of the lower uterine segment calls for caution lest rupture occur. Demelin (7) makes light of this danger because the segment usually containing most of the fœtus exhibits a thick and retracted wall. Yet Rossa (24) ruptured the lower segment. To me the danger has appeared to lie in tearing the attenuated lower segment away from the upper while manually dilating the collar, which is often as thick as the edge of the hand. This kind of injury occurred before Pomeroy's laparatomy in the specimen pictured in Figures 1 and 2.

### EMBRYOTOMY

Embryotomy is feasible and successful in most cases where forceps or version fail.

Budin (see Chéron) gave up attempts with the forceps and version to resort to embryotomy in five out of twelve cases. Hicks (15), in a face-and-hand presentation in which forceps and version effected nothing, the extended head being movable above the pubes, and the ring above it, perforated and then removed the head, when he was able to turn, saving the mother. In another patient, also at term, after about fourteen hours of labor much the same conditions obtained, with an oblique ring four inches above the pubes, the lower segment lax and containing head, arm, and leg. After emptying and crushing the head, a difficult version extracted the fœtus, the mother dying in half an hour. The autopsy showed an ample pelvis and there was found no ring present twenty-four hours after delivery, as is usual. Pery (19), in a woman who had had three normal labors, was unable to extract by forceps a head held by the contracture beneath it. He applied the basiotribe, though the child was living, the mother dying a few days later. Elliott (see West, 32) had two cases of brow presentations where the annular contracture called for craniotomy on the living child after forceps and version failed, the mothers recovering; but Vallois and Vallée lost their cases. Sinnetamby (26), in a II-para where the first labor had been normal, after sixteen hours in labor, and twenty since the water had drained away, found a transverse presentation with a ring in tetanic contraction admitting two fingers. Version failing under anæsthesia, the neck was severed, and traction on the arm tried. Barnes' cranioclast applied to the upper trunk was required to deliver the body, the ring yielding suddenly. Forceps brought the head. The patient recovered. Andrews (1), like

Gaulard (4), after trying version and forceps and embryotomy, was entirely unable to empty all fœtal parts from the uterus, and both had to do hysterectomies because of the severity of the crushing operations.

It will thus be seen that the apparently sensible formula: "Don't cut up the mother but reach through the hour-glass opening and get the child piecemeal" is less rational than it seems, and not always applicable. First, because of the distance from the entrance to the barrier. For it is noteworthy that not one of the obstetric obstructions is so far from the exit as this one, well beyond the bony inlet, often navel-high. Second, when the intervening channel between rescuer and partition is completely distended with fœtal parts. Third, because the passenger is sacrificed at no inconsiderable risk of battering the sides of the passage. Lastly, because inability to get away all the fœtal parts has presented itself at least twice, and the short-cut through the abdominal wall had to be the last instead of the first resort.

All this is not to say that section is to be the first measure in mind in ring contracture or ring tetany. But it is to say that exactly as the obstetrician with surgical sense and training does not jeopardize his patient's chances, in cases where her narrowed bony inlet makes safe delivery improbable, by long trial of other means, but early opens the abdomen, so in this, the most dangerous obstruction of the soft parts, immediate consideration must be given to the chances offered by Cæsarean section in all cases where the child is alive.

I here insert the case reports of Drs. Holden and Watt.

### CÆSAREAN SECTION FOR CONTRACTION RING

By FREDERICK C. HOLDEN, M.D.

Mrs. K. S., (No. 36999, M. E. Hospital), primipara, 22 years old; admitted June 24, 1910, at term. She had been in labor 20 hours, with the membranes ruptured and complete dilatation for 6 hours. Patient's condition good, pulse 88, labor pains very strong and regular. Dr. H. H. Hemstreet had recognized the presentation and posture, and, with Dr. W. A. Peterson, had, under chloroform, attempted flexion of head and rotation of the mento-posterior. Rotation could not be maintained, which led to their identification of the cause as an extreme contraction of the ring on the neck.

Fig. 3.

Examination showed a full-term uterus with a live child, pulse 160. Her external measurements were: Interspinous, 22½ cm.; intercristal, 28½ cm.; external conjugate, 19 cm; estimated internal conjugate, 10 cm. On internal examination, under chloroform anæsthesia, the cervix was fully dilated, fœtus in L. M. P. position, and a firm contraction ring around the child's neck and shoulders, completely preventing flexion of the head. Twenty-two hours after the onset of labor, seven and a half after membranes ruptured, six hours after the collar was found, a Cæsarean section was done by me, with the courteous assistance of Dr. J. O. Polak, under chloroform and oxygen anæsthesia. Through a right rectus incision extending three inches above and below the umbilicus, and a longitudinal uterine incision which was made low down so as to sever the retraction ring, a normal child weighing 6 lbs. 10 oz., was delivered; 48 cm. long, suboccipito-bregmatic of 10 cm., biparietal of 10 cm., occipito-mental 14 cm., occipito-frontal 14 cm. After the removal of the placenta and membranes, a compress saturated with tincture of iodine was passed through the cervix from above and removed from the vagina at the completion of the operation. Uterus closed with interrupted chromic catgut, two sutures placed at half-inch intervals through the uterine muscularis down to but not including the mucosa, and with a Lembert suture the uterine peritoneum was brought over and buried the interrupted sutures. The peritoneum was closed with running plain catgut, rectus fascia overlapped with interrupted chromic catgut sutures, and skin approximated by silkworm gut. Time of completed operation 18 minutes.

Patient fully conscious and asking for something to eat in an hour. Fowler position instituted at once.

Very comfortable, uninterrupted convalescence; wound closed by primary union and out of bed on the 18th day.

This is thought to be the second instance of election of section as soon as manual dilatation failed, and the first undertaken without risking the child's life by forceps traction on a neck that had been held several hours firmly grasped by the ring.

The amount of power exerted by the ring, as well as its breadth from top to bottom, can be partly demonstrated graphically in the two tracings presented herewith. They were drawn by Dr. Dickinson as soon as he had resuscitated the child. The neck is extraordinarily elongated and thinned. The distance from chin to sternum is 6.2 cm., and from occipital protuberance to seventh cervical 3.4 cm. The face presents the usual edœma of this presentation. G. Martin's case of a dead child of 2,950 cm., the head transverse, showed this strangle-hold and swollen livid face. After the delivery by the natural passage the continuing contraction made his removal of the placenta difficult.

## CÆSAREAN SECTION FOR IMPASSABLE CONTRACTION RING[1]

### Ring Holding Back Shoulders; Failure of Forceps and Digital Dilation, Cæsarean Section; Death of Mother. (Two Cases)

By JAMES WATT, M.D., Brooklyn, New York

Case 1. Mrs. A. V., primipara, aged 26, married one year, was referred by Dr. F. C. Crawford. The preliminary examination revealed a poorly nourished woman, weighing 120 pounds, with a phthisical family history. Pelvic measurements ample, left occipito anterior position, fœtal heart 140. Her condition remained the same up to the beginning of active labor, which took place at term.

The first stage was slow, the pains averaging 20 minute intervals for 48 hours. The cervix was soft, membranes detached, contractions good and the head in the cavity, in the left occipito anterior position. At the end of the fifty-second hour the first stage was complete and the membranes ruptured spontaneously. After waiting for some time and finding no progress, the doctor applied forceps, using more than the ordinary amount of traction force, with no result.

He then made a careful vaginal examination and discovered the impediment to the progress of labor was due to a thick, resisting band, completely encircling the child's neck. A suppository of opium and belladonna was now administered, and later morphine, hyocine and cactine hypodermically. These had no effect, except to rest the patient. She was now completely anæsthetised, and kept so for a period of twenty minutes; but this failed to relax the ring. It was at this period that the writer first saw the case. One palpating the abdomen could feel a distinct transverse sulcus running across the uterus about two inches above the symphysis. The uterus was in tonic contraction. The external os was obliterated and no appreciable internal os could be made out. The head lay in the cavity in the left occipito anterior position, and seemingly on the findings thus far, delivery could be easily accomplished with forceps. The writer would surely have made the attempt, had not his attention been directed to the contraction ring. On passing the fingers along side of the head, a tight, resisting ring could be felt, about the thickness of one's finger, completely encircling the neck which lay just above the inlet. An attempt was made to introduce a finger between the ring and the child's neck, for the purpose of dilation, but failed. A short trial was then given the axis-traction forceps, using excessive force, in the hope that the shoulders would dilate the ring sufficiently to complete the delivery. This seemingly increased the thickness and rigidity of the ring.

The mother and child were in fair condition, considering the prolonged labor, and the two attempts at forceps, and although one would hesitate to do a section at this stage, having in mind the high mortality of the Cæsarean operation in the late cases, the writer was confident that extreme aseptic care had been used in all of the preceding manipulations, and the operation was selected in lieu of embryotomy; the patient and husband understanding the increased risk.

At the operation the contraction ring was distinctly seen and felt as a deep furrow extending completely around the uterus. It retained its form after division and the emptying of the uterus. Both patients did well up to the fifth day, when the mother developed septic peritonitis and died on the ninth day. The child is still alive.

Case 2. Mrs. A. D., 23 years old, married one year, primipara, referred by Dr. H. Moses. She had indulged in golf, tennis and other athletics during her girlhood, and was a strong muscular woman. Her health during pregnancy was excellent, without inconvenience up to the beginning of labor, which was at term.

Notwithstanding the fact that the pains were excessive, the first stage was slow, requiring forty-eight hours for its completion. She entered the second stage in good condition, with the head engaged in the left occipito anterior position, and the contractions strong and regular. After being four hours in this stage no progress was noted, forceps were applied and traction made for a period of half an hour with negative result.

The doctor, realizing that he was dealing with some element of dystocia, sent the case to the writer at the Long Island College Hospital, where the following conditions were noted: Mother and child in good general condition, fœtal heart 150, pelvis ample; abdomen tense; uterus in tonic contraction, external os fully dilated, head engaged, now in the left occipito posterior position; which the writer considered, at this time the cause for the failure of the forceps.

Under chloroform anæsthesia and in the Trendelenberg position an attempt made to dislodge the head for the purpose of rotation failed. The writer now considered that he was dealing with an impacted occipito posterior position, which might yield to axis traction forceps; an attempt was made, using more than the ordinary traction force, but failed to advance the

[1] Presented by invitation before The American Gynecological Society, Washington, D. C., May 5, 1910. Read by title.

head. A second and more strenuous attempt was undertaken to dislodge the head, for the purpose of version, and this also failed. The craniotomy tools were prepared and the writer was about to perforate the skull, when the cause of the obstruction to delivery was discovered, in a band girdling the child's neck about one inch above the pelvic brim. This band could only be felt on the anterior and right side of the uterus.

The writer must confess that he was at a loss to know what to do. Craniotomy would be of no value. Decapitation and subsequent embryotomy, was a questionable procedure, for one could not foretell, until after removing the head, if it was possible to dilate the ring sufficiently to deliver the trunk.

The mother's condition at this time was not all that could be desired, for a successful Cæsarean section; but in view of the careful attention she had received before coming under my care, the operation was selected in lieu of embryotomy and a possible subsequent hysterectomy.

In this case after opening the abdomen the uterus was eventrated, and a deep transverse sulcus, extending completely around the organ, could be seen and felt. The situation of the ring necessitated the incision in the uterus being lower than usual. The ring retained its character after emptying the uterus.

The mother did not rally after the operation and died in twelve hours. The child did well.

### CONCLUSIONS

It is unfortunate that the diagnosis of this condition cannot be made until the labor is well established, for the reason that the contraction ring has no existence, in a pronounced or noticeable form, save during the act of labor; therefore, as an indication for Cæsarean section, it cannot be classed with the indications for primary sections.

It has been the writer's custom, during the past year to examine for the contraction ring in all cases of delayed labor. It has been present, in different degrees, in a number of cases, and seemingly was the cause of obstruction to delivery. In all of the cases, except the two just reported, the ring relaxed under morphine or complete anæsthesia, and the deliveries were easily accomplished with forceps.

It is the writer's opinion that Bandl's ring is present in a degree sufficient to obstruct labor more often than one is led to suppose, and that the cases of delayed second stage, other conditions being normal, that deliver themselves spontaneously after being anæsthetised, are due in numerous instances to the contraction of Bandl's ring.

In considering this topic as an indication for Cæsarean section, it should be undertaken only when the following conditions are present: Child living and in good condition, failure to dilate the ring or to relax it with morphine and complete anæsthesia; mother in fair condition for surgical work and not infected.

### SUMMARY (DICKINSON)

The retraction ring is the lower edge of the muscle of the body of the parturient uterus in action. Clinically it is of no importance to decide whether the ring is the anatomical internal os or not. Its presence is a physiological occurrence resulting from normal activity, which in excess or unbalanced development may constitute either a slight or a serious obstruction to delivery. It appears in three degrees:

1. As the lower boundary of the muscle of the uterine wall in action; curving under the presenting part or fitting into a depression of the fœtal mass; palpable during contractions and disappearing later in the labor, i. e., *physiological contraction of the ring.*

2. As an obstinately tenacious hour-glass narrowing occurring in the later stages of labor; its tension and resistance increased during each pain; in association with shortening and thickening of the entire wall of the body of the uterus, i. e., *contracture of the ring.*

3. As a girdle locked in continuous spasm; in connection with and part of tetanus of the body of the uterus late in labor, i. e., *tetanus of the ring.*

If there seems to occur a relaxed uterine body above a stable contracture, it is late in labor, when the muscle above never lets go entirely.

The physiological ring develops at the pelvic inlet, and it may be either a circle or a crescent, horizontal or oblique. With increasing cramp it climbs higher, even to the level of the navel, the thinned lower uterine segment lying between the ring and the external os, 5 to 20 cm. below. The girdle may be palpated externally, or determined by vaginal examination, the latter being sometimes blocked by the fœtal parts in the lower uterine segment or by a large bag of waters. There is no necessary relation between the size of the obstruction ring and the prognosis of delay. Yielding or not yielding depends on which is stronger, the driving power above or the spasm below. The ring either retains the fœtus in the uterine body, leaving the lower uterine segment empty, or it encircles a part of the fœtus, usually the neck, the head swinging like a pendulum in the lower segment.

Infrequency of reported occurrence is probably due to lack of routine search in all cases of long labor with second-stage delay not otherwise accounted for.

*A third of the mothers and half the children died* in the reported cases. The factors affecting the mortality are chiefly: Early diagnosis, aseptic care, judgment in choice of methods. Relatively early recognition is the most important single factor of safety. Choice of measures in obstructions due to the bony canal is being standardized. A standard of agreement as to methods of relief of obstructions of the soft parts should be worked out. This obstruction of the birth canal is more distant from the exit than any other whatever, and calls for consideration of the proper place for its relief by laparotomy.

With a dead child relaxation of the spasm by morphia and complete ether narcosis, and extraction by forceps or version (two-thirds) or embryotomy (one-third) is usually effective. It has happened that embryotomy and basiotripsy failed to empty the uterus, and in the presence or fear of sepsis section and hysterectomy were necessitated. In a case not infected, with the dead fœtus locked up behind an undilatable two-finger ring far above the pelvic inlet, under hospital care, Cæsarean section is to be preferred to embryotomy. These cases call for hospital care.

The child living, in every case a persistent trial is made to relax and dilate the ring by rest, morphia, full surgical anæsthesia under ether, and patient manual dilatation. In head cases a fair essay of forceps, short of the risk of cerebral hæmorrhage, and combined with expression, is undertaken. In transverse cases, version should be attempted, bearing in mind the risk of rupture owing to tetanus of the body of the uterus. Failing with forceps in head cases and version in transverse, the fœtal heart good and the cord unharmed, choice is made between embryotomy and laparotomy. Embryotomy will be usually chosen because of the frequency of lowered vitality in the child; when accessibility favors this operation, and because of a lessened risk to the mother in most instances.

With mother and child in fair condition, with infection unlikely, with a ring not yielding to a combination of morphia, etherization, and manual dilatation and traction, Cæsarean section is indicated in preference to embryotomy, and should be undertaken if the parents elect a somewhat increased risk for the sake of the child. Cæsarean is safer than embryotomy in the worst degrees of ring contracture and tetany, located high, provided infection is improbable.

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# MALIGNANT RHABDOMYOMA OF THE VAGINA IN CHILDREN [1]

BY C. JEFF. MILLER, M. D., AND FRASER B. GURD, M. D., NEW ORLEANS, LOUISIANA

MALIGNANT neoplasms arising in the vagina in infants are by no means frequent and among such tumors a new growth which has usually been called a sarcoma is the most important. Owing to the curious polypoidal formation presented by this tumor it has been called by some authors botryoides. This type of new growth has certain characteristic clinical features, and pathologically is a most interesting field for study. Considerable difference of opinion exists between pathologists as to the proper classification both with reference to its histogenesis and the nature of the constituent cells.

In reporting the following case an effort will be made to simplify the cytology of the tumor and, in so far as possible, to explain the clinical appearance and course, in the light of the information gained from the histological study.

The clinical features of the botryoides type of tumor are, as a rule, characteristic although there may be an absence of symptoms during a greater part of the intravaginal growth. In many of the recorded cases there seems to be a latent state, or a period of very slow progress; in others a peculiar stage of apparently benign proliferation precedes the rapid development of the growth later on. The first symptom is often hæmorrhage, varying from a slight stain to severe and continued bleeding. Bladder disturbances rank next in frequency, owing to the fact that the growth is usually situated on the anterior vaginal wall. As the growth enlarges constipation and difficult defecation become prominent symptoms.

In not a few instances the appearance of the growth at the vulva is the first symptom noted. Pain is not constant and is usually coincident with the vaginal distension, or with the retention of urine, and often ceases when growth appears outside of the vulva. Owing to the great tendency to inflammatory changes in the superficial parts of the growth the majority of cases soon present a septic picture. An offensive, ichorous discharge is reported in nearly every case and because of the difficulties of exploring beyond the vulva in children, one might easily confuse the condition with an infectious process. Sepsis is the cause of death in the majority of cases; the infection extending to the bladder and kidneys or peritoneum. The progress of the tumor is by continuity of tissue, metastasis either by lymph or blood stream not having been reported.

In the beginning the growth is found more often on the anterior or lateral vaginal walls, rarely on the posterior wall, and has a uniform, smooth surface and a spherical form. Ludwig

[1] From the Pathological Laboratory, Tulane University of Louisiana.

Pick (1) found the point of origin to be in the anterior vaginal wall in 9 of fourteen cases, two arose from the right, one from the left, and two from the posterior wall. Extension to the rectum has been recorded in only one case (Rollin).

As active growth occurs various centers of proliferation raise the surface of the tumor into bosses, which gradually become more and more pedunculated. The base of the growth may rapidly invade the entire vagina and is usually extremely infiltrated. With the increase in size of the tumor the vagina becomes widely dilated and the mass eventually appears at the vulva, presenting the well known "grape-like" tumor, or polypoidal sarcoma.

The pedunculated masses are generally ovoid, greenish yellow in color, slightly translucent, and may be stained by hæmorrhage. The masses exude a serous fluid, but do not collapse when incised.

The course of the disease is usually rapidly fatal. The patients emaciate and frequently die within a month after its appearance. Others have lived as long as six years.

There are only two unquestioned recoveries on record, one of these being Volkmann's (2) case. In this instance Volkmann removed a pedunculated polypoid mass from the posterior vaginal wall of a girl two years old, which was composed of round and spindle cells. The growth promptly returned, but after a second operation the patient remained well during a period of ten years.

### REPORT OF A CASE

R. M. W., aged 2 years and 4 months, was referred by Dr. S. Gill, October 10, 1909. Both parents were living and gave good personal and family histories. She was well developed, and had never been seriously ill, and while fairly well nourished was beginning to show signs of anæmia. She had never complained of pain. The first symptoms to attract the attention of the mother were slight straining during defecation, and a vag nal discharge which gradually increased and became quite offensive. Her physician was summoned only when the discharge became blood stained.

The first examination suggested a diagnosis of severe vaginitis, probably gonorrhœal. The vulva was red, slightly swollen, and excoriated; the hymen was thickened and presented some peculiar tiny vegetations resembling vulval warts. There had been a slight rise of temperature for over two weeks. Owing to the small orifice it was impossible to reach a conclusion as to the cause of the trouble, so the parents were advised to allow an examination under anæsthesia. Under ether anæsthesia the hymen was dilated. There immediately poured forth two or three ounces of foul, purulent fluid, containing friable, gelatinous, reddish gray masses, some of which protruded from the vulva but still hung by fragile pedicles. The vagina was found to be dilated to the capacity of the pelvic capacity by the tumor mass. About four ounces of the mass was twisted, scraped, and wiped away, and wherever the base of pedicles could be reached the actual cautery was applied.

Hæmorrhage was not severe, but it was necessary to tampon the vagina with gauze. Much to our surprise the little patient hardly complained after the operation. After 48 hours the slight septic temperature declined and she rapidly gained weight. She continued to improve and was free from symptoms for five weeks, then the discharge returned and the mother noticed that she urinated with difficulty. The patient was brought for further advice and upon examination it was found that not only was the vagina filled, but that a movable mass reaching almost to the umbilicus was palpable over the abdomen.

An unfavorable prognosis had already been given so that when the return of the growth was found to have been so rapid, further interference appeared to ofler little prospect of relief. In view of the fact, however, that metastases so seldom occur it seemed justifiable to attempt the removal of the entire mass. The parents readily consented to any measure that might give even temporary relief, so the abdomen was opened December 8, 1909.

The mass proved to be the dilated vagina. The tiny uterus and appendages were perched upon the distended vagina and the bladder had been drawn upward almost to the umbilicus. No evidence of extension beyond the vagina could be detected. The entire vagina, uterus, and appendages were removed. The isolation of the ureters and the vagina was accomplished with surprising ease. Owing to the shallow pelvis the dissection of the vagina was completed down to the vulva. Very little hæmorrhage occurred.

The patient was considerably shocked for 12 hours, but rallied and made an uneventful recovery with the exception of some suppuration of the wound at the lower end of the incision, which persisted for four weeks.

Six weeks after the operation the vaginal discharge returned and soon became fetid. The abdomen gradually enlarged and became sensitive above the pubes. The temperature began to range between 99 and 101 degrees. The inguinal glands on both sides became enlarged and sensitive, apparently the result of infection. She rapidly declined and died February 14th. Unfortunately it was impossible to procure an autopsy.

*Gross description of tumor.* The specimen removed at first operation consisted of a collection of tumor nodules about 30 in all. The nodules were oval or spherical in shape, varying in size from .2 to 1.8 cm. in diameter. They were soft grayish pink or greenish gray in color. The surface of the nodules was smooth

Fig. 1. Drawing of section of tumor, showing uterus and appendages, distended vagina, and tumor.

and glistening. Upon section the cut surface was homogeneous, more or less translucent in appearance, and exuded a large amount of clear fluid. The nodules retained, however, their contour even after incision and loss of fluid.

The tumor removed at second operation consisted of masses 9 cm. x 7 cm. x 6 cm. in diameter. The surface was, for the most part, smooth and glistening, and of a pale pinkish color with an outline of very fine blood-vessels showing through the transparent covering. One portion was rough and irregular in appearance, presenting several cystic areas which had been ruptured varying from 2 to 4 cm. in diameter. The lining membrane of the cysts was composed of irregular cauliflower-like protuberances, grayish pink in color and measuring from .2 to 1 cm. in diameter. Upon section the tumor was found to consist of a soft, grayish pink, semi-translucent looking, more or less homogeneous material. Several larger and smaller cysts, with a lining similar to that already described were also found.

Upon dissection of the mass the apparent cystic appearance is seen the result of the irregular dilatations of the vagina. From the upper portion of the tumor projects the fundus of a small infantile uterus, 1 cm. in length, 1.5 cm. in breadth. Normal infantile tubes and ovaries were also present. From the relation of the uterus and appendages the smooth surface of the tumor is apparently situated posteriorly, that portion which had been torn in removal being the anterior.

The tumor in both instances was fixed in Zenker's fluid, formaline, and alcohol, and imbedded in paraffin. Sections were cut and stained with eosinmethylene blue Unna's orcein method for elastic tissue, and Mallory's phosphotungstic acid hæmatein, and connective tissue stains. The phosphotungistic acid hæmatein proved of the greatest value as it served to differentiate between myoglia and filroglia fibers. The clearness, too, of the nuclear changes as well as the distinctness of the striations in the muscle tissue when this method was used proved invaluable in the determination of the finer histological changes.

Section 1, examined by the unaided eye, presents an irregular papilliform appearance of small more or less circular nodules arranged about a central stalk, the individual nodules measuring 1.5 mm. in diameter or less.

*Microscopically*. The sections show a number of more or less spherical collections of tumor cells, situated beneath the normal looking stratified epithelium and separated from the deep layer by a very narrow band of connective tissue. The tumor cells present two distinct types; one a comparatively large cell with an oval-shaped vesicular nucleus, having a definite chromatin network, and a small amount of neutrophilic, non-granular protoplasm. Some of the cells of this type are distinctly smaller and contain nuclei which stain more intensely. Very large numbers of these cells are in mitosis. The other type of cell is very irregular in size and shape, has a deeply acidophilic protoplasm with from one to four or six deep black staining, irregular-shaped nuclei. The nuclei of these cells vary in size from 7 to 20 microns in length, and from 3 to 10 microns in breadth, in some being definitely oval-shaped and situated about the center of the larger spindle-shaped cells; in others the nuclei are extremely irregular in shape and stain intensely black. In many of the cells, especially those more columnar in appearance, the nuclei are situated transversely across the cell presenting the shape of irregular rods or crescents. Mitosis in these cells is not demonstrable although many of the chromatin rods are extremely suggestive of paryopinetic figures. As mentioned above, the protoplasm of these cells is very irregular in shape, many having a resemblance to connective tissue cells. Many cells, however, have a nucleus situated more to one end and show a very long drawn out fiber stretching across

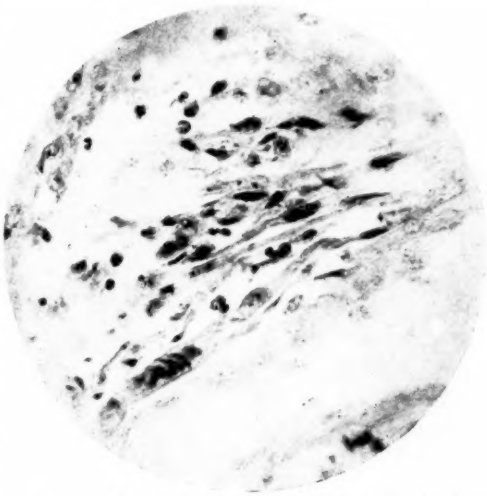

Fig. 2. Microphotograph (oil immersion) showing long muscle fibers containing numerous nuclei.

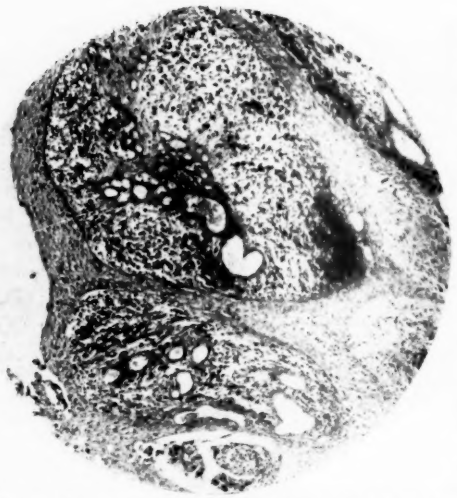

Fig. 3. Low power photograph of tumor showing nodular masses of tumor cells beneath the epithelium and vessels lying in the connective tissue stroma.

the field of the oil immersion. These spindle-shaped cells can be seen apparently continuing into the formation of a second cell with another spindle-shaped nucleus without apparently any break in the continuity of the protoplasm. A certain number of the cells are definitely columnar in shape, measuring about 10 microns in diameter and 15 to 60 microns in length. As already mentioned, the nuclei in most of the cells are situated transversely across the cell and for the most part are grouped together in clumps of 4 to 6 in the central portion of the protoplasm. Some columnar masses of protoplasm contain as many as 10 well formed vesicular nuclei arranged directly behind one another and surrounded with but little protoplasm.

The protoplasm of these larger columnar cells in specimens stained with phosphotungistic acid hæmatein shows a definite longitudinal splitting up into bundles which gives rise to the tube-like appearance so frequently described. A few cells show definite transverse striations. Transverse striations are also noted in some of the spindle-shaped cells. The striations cannot be made out by the ordinary methylene blue nor hæmatoxylin eosin stains, but with the phosphotungistic acid hæmatein appear as deep black irregular stripes or granules. The protoplasm of the first group of cells appears blue with the phosphotungistic acid hæmatein the fibrillæ in the cells are indistinct and are bluish brown in color. The protoplasm and fibrillæ of the second group stain an intense blue-black. In places the tissue appears to be made of, almost entirely, the blue-black staining cells. By Unna's orcein method no elastic tissue can be demonstrated. Stained by Mallory's connective tissue stain the tumor cells of the second group have a brownish protoplasm with brownish fibrillæ. Between the tumor cells is present a fine network of fibers staining brown with phosphotungistic acid hæmatein and blue with Mallory's connective tissue stain. These fibers, as well as the cells lying intimately associated with them, apparently arise from the fibrous tissue stalk about which the tumor cells are arranged. In cross section the acidiphilic cells are circular, with a nucleus situated toward the periphery.

The spherical nodules of tumor cells are arranged upon connective tissue stalks, which in turn are connected with a central connective tissue area which shows very large lymphatic spaces filled with serum, together with a few small blood-vessels. Nowhere are blood spaces seen in close opposition to the tumor cells. All vessels are lying in a moderate amount of supporting connective tissue.

Section 2 from a larger nodule in the vagina, consists of a circular piece of tissue .8 cm. in diameter. Upon one surface it is covered with a layer of squamous epithelium, 6 cells in depth. A layer of cells similar to those seen in section 1 is separated from the epithelium by a layer of œdematous fibrous tissue. This denser layer of tumor cells is comparatively narrow, the greater part of the tumor being composed of very loose œdematous fibrillar structure. Scattered throughout this section are cells similar in appearance to those found in section 1. Many of the red staining multinucleated cells in this section are extremely characteristic of the usually described malignant rhabdomyoma.

Section 3, a portion of the large tumor from the pelvis, shows an extremely loose, œdematous structure with a moderate amount of fibrous tissue network which contains everywhere a small number of both types of cells, the red staining cells being, however, in marked minority.

The glycogen globules described by Marchand (3) are not present in any sections examined.

The tumor is one of those well recognized neoplasms occurring in the vagina in infants and usually called a sarcoma. Frequently according to literature, these tumors contain only cells of the connective tissue type but embryonic striped muscle cells have been not infrequently referred to. The tumor is unusual, one might almost say rare. Owing to the fact that so many tumors contain muscle tissue, it is questionable whether the term sarcoma is absolutely precise.

The cells first described appear at first sight to belong undoubtedly to the connective tissue group, there being no evidence that they are developed from muscle tissue. The protoplasm is characteristic of that found in the cells of the ordinary rapidly growing large oval-celled sarcoma, the nucleus shows no particular feature. That this cell is playing a very important part in the growth of the tumor is apparent from the enormous numbers of mitotic figures. Although these cells have no attributes making it possible to consider them muscle cells, it is, however, possible to look upon them as less differentiated types of the mesoblastic cell than the muscle cell proper.

The embryonic forms of striped muscle cells here found are similar to those found in rhabdomyomatous tumors elsewhere, with the exception of those arising

from cardiac muscle. In less malignant tumors the cells show, as a rule, more marked transverse striations. The inference from this fact is, as might be expected that the more embryonic the type of cell, that is to say, the less differentiated and more nearly approaching the original mesoblastic "anlage" the more malignant the tumor. It is found, in general, with ordinary connective tissue malignant new growths, i. e., sarcomata, that the more similar in appearance the cells of the tumor are to the adult fibrous tissue cell, the less rapidly growing and the less liable to metastasis is the tumor. The cellular fibroma or connective tissue tumor in which the individual cells have maintained or developed their function of producing fibers is a less harmful tumor than the spindle-celled sarcoma, which in turn is less rapidly growing and less prone to metastasis than is the round-celled tumor. In the same way, apparently, the muscle tumors develop increased capacity for growth as they lose or fail to develop their morphological differentiation. If these tumors are considered as being composed of two separate distinct types of cells, viz., connective tissue and striped muscle cells, it must be inferred that either there is a misplacement or non-development of cells which are potential to produce both connective tissue and muscle cells, or undifferentiated cells of both types are prevented in some way from reaching maturity.

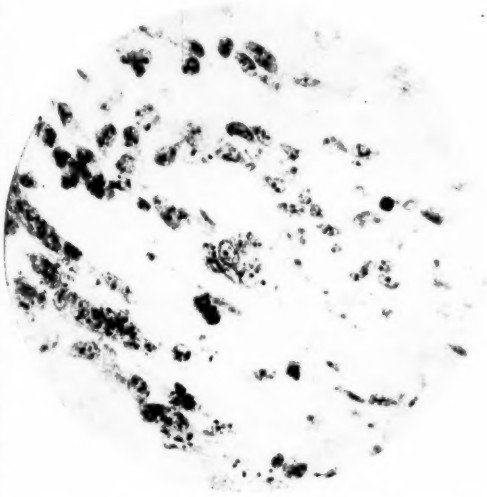

Fig. 4. Microphotograph (oil immersion) showing large multinucleated cells surrounded by characteristic tumor cells, also several mitotic figures.

Tumors of this nature arising from the subepithelial tissues of the lower genital tract in infants, are, apparently, embryonic in origin. By that is meant that the "anlage" of the tumor is the result of some maldevelopment of certain cells during fœtal life rather than that fully developed cells revert to a more primitive type. Although considerable difference of opinion exists as to whether the tumors are "embryonic" this diversity is the result rather of a confusion of the terms embryonic and congenital. Wilms has reported a case in which the condition existed at birth. Rollin (1) doubts whether it is ever congenital.

If we accept the theory that all the cells of the tumor are of the same origin, that is, if we consider them to be the result of the arrested differentiation of the primitive voluntary muscle cells which have developed, but to a slight extent, the power of building up the characteristic protoplasm which we are accustomed to consider as being evidence of the presence of voluntary muscular tissue, we exclude the necessity of accepting the theory of the displacement and non-differentiation of two types of cells or on the other hand of explaining why displaced cells should develop until differentiated into connective tissue and muscular tissue and then become arrested.

The usual mixed tumors, such as those of the ovary, testicle, epignanthus, etc., occur in places in which it seems reasonable to expect the presence of polypotential cells. The rhabdomyoma usually appears in the genito-urinary tract as represented by the kidney, uterus, and vagina, and here it is somewhat more difficult to explain the presence of the various elements. It would seem easier to explain the malignant rhabdomyoma by accepting the view that all cells are essentially myotomic in origin. It is justifiable, we think, to consider the possibility of the condition being the result of the misplacement of the muscular anlage during the development of the mesonephros or pronephros; since we find the tumors occurring along the course of Müller's duct.

The possibility of the bosophilic cells being a malignant type of the ordinary connective tissue supporting substance of the muscle, perhaps in a manner similar to the change which takes place in the stroma of mouse cancer is to be thought of, but such a change in malignant growths in the human being, so far, has not been recognized. The probability, then, is

that rhabdomyomata are the result of but slightly differentiated embryonic muscle cells. That they are extremely malignant is borne out by the clinical course and explained by the type of cell present and the enormous numbers of mitotic figures.

It is difficult to explain why the tumor should constantly result in the development of the grape-like protuberances which have given it its name botryoides. Apparently the development of the tumor within the layers of the corium makes it possible for the growth to project outwards with less opposition than backwards into the denser tissues with the result that a polypoidal tumor is found covered as it must be by the epithelium which increases in surface in spreading over the tumor. That the tumor grows rather by expansion than infiltration is shown by the constant appearance of the narrow band of chorion beneath the deep layer of the skin, the resulting absence of ulceration, and the spread of the tumor through the loose tissues about the organs of the pelvis rather than the invasion of the uterus, bladder, or bones

Ribbert (4) states that rhabdomyomata are most frequently met with in the kidney. Tumors may grow here to the size of a full term fœtal head. The kidney substance is usually pressed to one side, the tumors growing by expansion rather than by infiltration. Occasionally a polypoidal growth into the pelvis of the kidney takes place. Vincenzi (5) found a tumor in the wall of the bladder resulting in a polypoidal mass filling the organ. Mixed tumors of the testicles not infrequently contain striped muscle tissue, as do also mixed tumors in the ovary. A polypoidal tumor is found in the uterus composed of unstriped muscle tissue sometimes according to records, along with other tissues. A characteristic of tumors in the uterus as well as in the vagina as demonstrated by our case, is the enormous amount of serum lying between the tissue fibers.

Individual cases of voluntary muscle tumors have been described in the lung, œsophagus. tongue, and prostate. In addition a certain number of benign collections of striped muscular tissue in the form of tumors in the general muscular tissue have been described. Rhabdomyoma of the heart is a well recognized tumor, some 12 cases occurring in literature (6). This tumor is much less malignant, death occurring in most cases from the results of other abnormalities, especially nervous lesions. The type of cell found in the tumor of the heart muscle is very different from that found in the tumor under discussion, being characterized by the presence in many of the cells of large vacuoles or spaces. The striations are well maintained and few mitotic figures are seen.

Practically all tumors of the vagina of this type have been found in infants or young children, bearing out the contention that the tumors are embryonic in origin. Metastases even of the most malignant tumor have rarely been reported. The absence of autopsy in our case makes it impossible to state whether or not metastasis had taken place. No evidence, however, of secondary growths existed. This absence of metastasis seems to be explained in our tumor by the fact that the blood-vessels are uniformly surrounded by a moderate amount of connective tissue, as is the case in epithelial tumors. This point also is suggestive of the tumors being composed of a single type of cell since it is usual in sarcomatous tumors to find the blood spaces separated from the tumor by but a single layer of endothelium with practically no surrounding connective tissue.

We prefer to apply to the tumor the term malignant rhabdomyoma rather than sarcoma, and although it is impossible to prove at present the histogenetic unity of the two types of cells, we consider that it is probable that the tumor is composed entirely of embryonic muscle cells and that it is not a mixed tumor. Of the thirty-nine cases collected in 1906 by Holmes (7) the histological findings varied greatly, small- and spindle-shaped sarcoma, endotheliomata, as well as tumors containing striped muscle cells having been described. It seems strange that tumors occurring in the same position and only in infants having the same macroscopic characteristics and similar clinical course should be composed of such diverse cellular elements. It is more reasonable to us to consider that all must be similar in histological pictures and that confusion has arisen as the result of insufficient methods of examination. It is easy to see from appearances in our

tumor how mistakes might arise from the examination of the different portions of the tumor. The œdema, which is apparently the result of pressure upon the efferent vessels in the pedicle of the individual nodules, owing to the large amount of fibrous tissue might lead to the suggestion from thick and insufficiently stained sections that the tumor might be an angiosarcoma, or as sometimes diagnosed, an endothelioma. The cells of the tumor proper are polymorphous, round and spindle cells are frequently seen, at times one or other forming the predominant characteristic. In our own tumor before special methods were applied, especially Mallory's phosphotungistic acid hæmatein, it was thought that the tumor was a mixed round- and spindle-celled sarcoma. That this is not the case subsequent study has proved.

As mentioned above, treatment has been unsatisfactory, but in the light of the pathologic findings there is reason for considering that operation ought to be of the greatest possible value. The tumor is not prone to metastasize nor is metastasis by the blood stream to be expected, since the blood-vessels are well protected. The individuals suffering from the disease do not emaciate, as breaking down is a late manifestation, suppurative changes the result of infection being the determining factor rather than an inherent tendency to necrosis such as we find in carcinoma.

Since the growth of the tumor is so rapid, leading to diffuse local extension by continuity and resulting early death, operation if undertaken must be absolutely complete as regards the local removal of all tumor tissue. No malignant neoplasms can be said to "recur," the growth following operation being in reality merely a continuation of activity on the part of the material not removed. As we have in the rhabdomyoma of the vagina a tumor which is unlikely to spread by the blood stream or apparently by means of the lymphatics, no growths should *prima facie* offer a better opportunity of complete cure. If this happy result is to be obtained diagnosis must be made as early as possible and a radical local removal undertaken at once.

Cases have been reported in which the polypoidal nodules have been snipped off, others have used the actual cautery, etc. It is evident that such measures must be unavailing. Complete extirpation of all diseased tissue, controlled by careful histologic study of the removed portions, alone can be of service. The removal may be attempted either by the abdominal or paravaginal route. The former method seems to be preferable, as it permits a smoother and more rapid operation and allows a thorough examination of the abdominal cavity for extension of the tumor. In very early cases it seems probable that, by utilizing microscopic examinations of the periphery of the extirpated tissue, the removal of merely a portion of the vaginal wall may suffice.

## CONCLUSIONS

A tumor is occasionally met with in the vagina of female infants, characterized by rapid growth and the development of polypoidal masses projecting into the lumen of the vagina.

Histologically this tumor is found to be composed of embryonic striped muscle tissue, hence a rhabdomyoma.

Growth is by expansion and the neoplasm does not metastasize; as a result complete removal locally ought to result in cure.

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# CONSERVATIVE SURGERY OF THE PELVIC ORGANS IN CASES OF PELVIC PERITONITIS AND OF UTERINE MYOMATA

## With the Review of the Immediate and After Results of 299 Cases

By JOHN G. CLARK, M. D., and C. C. NORRIS, M. D., Philadelphia, Pennsylvania

## PART I

THE advantages to be derived from conservative pelvic surgery are now well recognized. This form of surgery is chiefly adapted to two classes of cases, viz., pelvic inflammatory disease and uterine myomata. These conditions differ so radically, both in the operative technique required and in the end results, that a definite distinction should be made between them.

### PELVIC INFLAMMATORY DISEASE — MICRO-ORGANISMS PRODUCING PELVIC INFLAMMATORY DISEASE

The etiology of pelvic inflammation in the female is of the utmost importance. If, before commencing his operation, it were possible for the surgeon to know positively with what type of infection he was dealing, a great advantage would be gained. Unfortunately this is not practicable in all cases, for occasionally rare forms of micro-organisms, such as some of the air bacilli and mixed infection, will defy all diagnostic means except the incubator, and this of course is not feasible until the abdomen is opened, and therefore is valueless as a surgical guide. Nevertheless the great majority of pelvis infections may be classed under three heads, the gonococcal, the pyogenic (streptococci and staphylococci), and the tubercular. Andrew (1) reports in the order of their frequency, the following micro-organisms: Gonococcal, 43 per cent; pyogenic (streptococcus and staphylococcus), 24 per cent; colon bacilli, 5 per cent; pneumonococcus, 4 per cent; tubercular, 1 to 3 per cent. Menge (32) reports the results from cultures of one hundred and six cases of tubal pus: Sterile, 68; gonococcal, 22; tubercular, 9; streptococcal, 4; staphylococcal, 1; anærobic bacilli, 2. While Hyde (27) in the examination of 2,973 cases, excluding tuberculosis, found the tubal contents sterile in 1,998; gonococcal in 579; other and mixed infections in 456. Noeggerarth and Wertheim (34) examined 312 cases with the following results, excluding all tubercular cases: Sterile, 122; gonococci, 56; streptococci, 11; staphylococci, 6. Of the infective micro-organisms, the gonococcus is by far the most frequent. Guthrie (13) collected statistics from fifteen operators in Iowa and found that 70 per cent of all their cases of pelvic inflammatory disease were of gonococcal origin.

A careful study of each case combined with a review of the history and a thorough pelvic examination will reveal the type of the infection in most cases. Crossen (13) rightly lays great stress on the importance of differentiating the pyogenic from the gonococcal infection and points out that a large proportion of the former follow childbirth or miscarriage, and that parauterine exudates and inflammatory are the rule. Gonococcal cases not infrequently give a history of vesical irritability and leucorrhœa appearing shortly after marriage or a suspicious coitus together with evidences of infection about the external genitalia, while the tubercular variety is often secondary to tuberculosis in other parts of the body and not infrequently occurs in virgins. The great importance of accurate diagnosis is shown by a study of the behavior of the various micro-organisms within the Fallopian tubes. The greater proportion of gonococcal cases become sterile and these undoubtedly constitute primarily the infective type of micro-organisms in many of those cases in which no cultures can be obtained. The time required for death or effective attenuation of the gonococcus within the Fallopian tubes is from two to four months, although in exceptional cases they may survive a longer period as shown by Neisser (33) who examined 143 cases of gonorrhœal pelvic inflammatory disease, all of which had been latent for a period of at least two months and some for as long as eight years. In this series, gonococci were present in eight cases. It is, however, probable that in many of these cases

the virulence was greatly attenuated. The pyogenic micro-organisms are much more erratic and frequently exist encapsulated and without losing their virulence for long periods; thus Miller (quoted by Crossen [13]) reports two cases, in one of which streptococcus existed for six years and in another for twelve years, while Martin (30) mentions one case of nineteen years' duration. Many cases are undoubtedly mixed infection as shown by Hyde's (27) series.

It is unfortunate, both from the surgical standpoint and for the possibility of the serum and bacterin therapy, that the variety of infective micro-organisms cannot be more definitely and scientifically determined in each case before operation. The newer work on serum and bacterin therapy seems to hold out a possibility for a more accurate diagnosis in many cases. The tuberculin test is apparently fairly accurate in determining the diagnosis in the tubercular cases, while Bruck (10) in reporting a series of cases from Neisser's clinic, claims that it is usually possible to obtain a cutaneous reaction in gonococcal cases following inoculation of vaccine (bacterins). As far as we can ascertain from a study of the literature on this subject, the gonococcal serum is of little value except in joint affection and its use is occasionally followed by deleterious results as shown by Uhle and Mackinney (57) who report that a urticarial eruption followed its injection in nearly one-third of their cases, while others suffered from pain and swelling at the site of inoculation. Gilmore (22) however, believes that vaccine therapy in gonorrhœa has a bright future. The bacterins are prepared from dead cultures of gonococci suspended in normal salt solution and seem to offer an excellent means for diagnosis in most cases, while in many, if properly administered, act as a curative agent. Better results are obtained by strains which have grown on artificial media for a long time rather than from fresh cultures. Thomas (53) believes the autogenous bacterins are the most effective. Hamilton (23) says that it is frequently possible to raise the opsonic index to the gonococci by the injection of bacterins and when this occurs an improvement in the clinical condition usually takes place. It seems doubtful if, at present, much advantage can be gained from the use of either bacterin or serum in pelvic inflammation as far as actual curative agents are concerned, although the bacterins are of undoubted value as a diagnostic sign. Wright (60) draws especial attention to the paralytic action brought to bear on the leucocytes by the tryptic ferments liberated from disintegrating pus cells in abscess cavities, and to the futility of attempting to cure them by vaccine therapy unless they are emptied frequently and flooded with opsonic fluid fresh from the circulating blood. Ballenger (4) has used bacterins in the treatment of twenty-six cases and in nearly all has obtained satisfactory results. Swinburne (52) believes bacterins slower in their action than the serum. There is no doubt that the entire subject of the diagnosis and treatment of gonorrhœa by either serum or bacterins is still under consideration, and requires more evidence both from clinical and laboratory researches before we can positively define its range of value.

Conservative surgery of the pelvic organs may be divided into operation on the tubes, ovaries, and the uterus.

### CONSERVATIVE SURGERY OF THE FALLOPIAN TUBES

This has, in our opinion, a very limited field. The presence of pus in the tube is an absolute indication for its removal in all cases. Small adherent tubes in which the abdominal ostii are closed should also be excised. The only cases in which a salpingostomy is ever justifiable is in old non-active hydrosalpinxes. One of the chief anatomical defects of a simple salpingostomy is that in a great number of cases, the intramural portion of the tube is occluded as well as the abdominal ostium. To overcome this, hysterosalpingostomy has been devised. The usual after history of all forms of salpingostomy is that the newly formed ostii close up and a recurrence of symptoms takes place, and this despite the utmost care displayed in the performance of the operation. The percentage of cases in which pregnancy takes place after salpingostomy, is small, while recurrences are frequent. Turk (55) reports eight cases in which salpingostomy was performed, two

SALPINGECTOMY AND CONSERVATION OF THE OVARY

The illustration represents a composite picture made from six specimens in which the blood-vessels have been injected. The important points in this operation are the non-interference with the ovarian blood supply, and the leaving of the ovary in a favorable position. In the removal of the tube, it should be separated from the extreme upper border of the mesosalpinx. Small blood-vessels should be ligated with fine catgut, special care being taken to avoid ligating en masse. It will be noticed that the large blood-vessels are in a very close apposition to the tube at the uterine cornu. At this point particular care should be taken not to injure the vessels. After having removed the tube and checked all bleeding, the top of the mesosalpinx should be whipped over with a fine running catgut suture. This should not be drawn too tight, for by so doing the free surface of the broad ligament may be puckered.

of which subsequently became pregnant. The cases, however, with one exception, are not recorded in detail and the condition of the opposite tube is not stated. Small or normal size tubes in which the abdominal ostium is open may be freed of adhesions, but better results will usually be obtained by their removal. We believe that unless there is some indication making maternity especially desirable, a conservative operation on the tubes should not be performed, and when necessary, the patient should be advised as to the nature of her condition and the likelihood of failure, and should herself be the one to decide the character of the operation. The general unsatisfactory results obtained by conservative tubal surgery may be attributed to the fact that the great majority of tubal inflammations are of gonococcal origin. One of the chief characteristics of the gonococcus is its persistence. After having once established itself in a location suitable for its growth, it is practically ineradicable unless the affected area is so situated that it is easily accessible to local treatment. It has been shown that gonococci may lie dormant in the tube for a long period and this persistence of the organism accounts for many of the failures in conservative surgery.

A brighter side of conservative tubal surgery is met when we consider those cases in which a normal tube exists on one side and a diseased tube on the other. In these cases the normal tube should be disturbed as little as possible. Excellent results have been obtained by this treatment and comparatively few such cases require a secondary operation. When it is decided to perform a salpingectomy, the radical operation, i. e., the removal of a wedge-shaped portion of the uterine cornua together with the intramural part of the tube, should be the operation of choice. The writers have seen, during the last six months, two case of cornual abscess and one case of intramural tubal pregnancy taking place in the stump left by a previous salpingectomy when the intramural portion of the tube had not been excised.

### CONSERVATIVE OVARIAN SURGERY

The ovary is the analogue of the testicle and is nearly or quite as important as that organ. For this reason considerable risks are justifiable for its preservation. In removing diseased tubes, the most that is done is to sterilize the patient, a process which has usually been previously performed by nature, while the results of a double oöphorectomy are at least in a certain proportion of cases to convert a previously normal woman into a hopeless neurasthenic. The sudden onset of the artificial menopause, with its accompanying nervous symptoms, the inability to successfully fulfil the marital relations, together with the mental affect produced by the cessation of the menses, the knowledge that is more or less suddenly and forcibly brought to the woman's mind that she is prematurely aged and that the possibilities of maternity have forever been removed, all tend to produce a most pitiable condition on the unhappy individual. There is no doubt that the age at which a double oöphorectomy is performed, together with the individual temperament of the patient, play a very decided part in the after history of these cases, and that some women bear the results of the operation much better than others. Too

much importance, however, cannot be placed on the age, as Peterson (39) has shown that some of the most serious artificial menopauses occur when the ovaries are removed between forty and forty-four years. While some patients may be relatively little affected by the operation, more than half will suffer very seriously and in a definite proportion the result will be little short of appalling. One has only to follow the after histories of a few cases to be convinced of the disastrous effects of a double oöphorectomy. In a large series of cases in which both ovaries were removed, Giles (21) found that the flushes and other symptoms of the artificial menopause continued for from three to four years in most cases and in some individuals persisted for ten years, severe mental depression occurs in 10 per cent to 33 per cent of cases, while of one hundred and fifty-seven cases two became insane. Sex instinct is entirely abolished in 16 per cent of cases and diminished in a further 16 per cent, and it is only a matter of time when this is entirely lost. It has been claimed that if one ovary is left behind it is sufficient. This is on the principle that "half a loaf is better than no bread." The patients upon whom a unilateral oöphorectomy is performed often menstruate scantily and have an early meopause. Giles (21), after careful review of one thousand abdominal sections, of which fifty were unilateral salpingo-oöphorectomy for pelvic inflammatory disease, concludes that the removal of one ovary causes irregularities, diminution, or cessation of the menstrual flow in a definite proportion of cases (16 per cent of his) and that in a somewhat smaller proportion (12 per cent) the sexual desire is lessened or abolished. In one hundred and thirty-three of our own cases in which one ovary had been removed, menstruation was diminished or irregular in fifty.

Carmichael (12) found that in animal experimentation, when one ovary was excised, there was a compensatory hypertrophy of the other and this doubtless takes place to a certain extent in the human race. This may account for some of the irregular bleedings which are occasionally present following conservative surgery.

A further comparison between the tube and ovary shows that the essential structure of the tube, i. e., the mucosa, is chiefly involved, while in the ovary, at least in gonococcal infections, the important portions are only destroyed in the last stages of the disease. A peri-oöphoritis is the most frequent accompaniment of a pyosalpinx and only in the advanced cases is an actual oöphoritis present. For this reason, when the primary source of the infection is removed, the ovary is prone to resolution. In examining the histological diagnoses of three hundred and sixty-eight ovaries removed consecutively for pelvic inflammatory disease at the University Hospital, we find two hundred and fifty-three cases of peri-oöphoritis, showing the relative frequency of this condition.

Resection of an ovary in some cases offers favorable results. The presence of pus in the ovary is, however, an indication for its removal. Esch (20) regards the pus contained in ovarian abscesses as being peculiarly virulent. Many such cases are undoubtedly of puerperal origin, the pyogenic micro-organisms having traveled directly through the broad ligament to the ovary. Notwithstanding this, in carefully selected cases, resection may be performed with fairly good results. If it has been found necessary to remove the opposite ovary, or the abscess be a small one and is so situated that it may be easily excised, and even if only a small amount of ovarian tissue can be left behind, the sudden onset of the menopause is often averted. In general, it may be stated that resection of any ovary possesses a very limited field of usefulness, the proportion of these cases which require a secondary operation being much higher than where an entire ovary is conserved. This is due to two factors, in the first place resected ovaries are always diseased organs, and in the second place, apart from the mutilation necessary, the circulation is often interfered with by the ovarian sutures. These necessarily pass deeply into the substance, of the ovary and as this organ is supplied by a central circulation, the latter is always more or less disturbed. Polak (40), in his painstaking study of the after histories of these cases, remarks that all resected ovaries become much enlarged following the operation. In the favorable cases, this enlargement begins to subside in about four weeks. Turretta (55) has studied the after results in a large series of ovarian resections

and speaks favorably of the operation in selected cases, and believes the reparative power of the ovary is very great, while Zacharias (61) has traced the after histories of three cases, in each of which one ovary was removed and the other resected. None of these patients had any untoward symptoms and all were menstruating regularly several years after the operation. Pugnat (42) believes strongly in the regenerative power of the ovary and that new germinal epithelium is produced together with the formation of new primordial and Graafian follicles. We merely quote this interesting statement, but consider it somewhat askance for it must be confirmed by further observation to make it tenable. Di Christina (14) thinks that the cut surfaces of a resected ovary heal by connective tissue process and that the cicatrix is gradually pushed to the surface. The authors have had the opportunity of examining two ovaries, histologically, upon which resection had been performed. Serial sections were made of these ovaries and no confirmatory evidence was obtained that new ovarian tissue is produced to take the place of the resected portion. Both of our specimens were of nearly normal size. In one, the scar could be distinguished macroscopically, while in the other it was not visible to the naked eye, but could be detected microscopically as a thin line of avascular connective tissue on the surface. That compensatory hypertrophy does take place, a very different process from regeneration, seems to be certain. We are led to this belief by the study of our own cases and by the work of Carmichael and Bell, which is reviewed elsewhere.

The cases which are most favorable for resection are those in which there is a single retention cyst, and this is especially true when the cyst tends to become pedunculated. These single retention cysts should not be confused with cystic degeneration of the ovaries. The latter offer very poor results for any form of conservative surgery. Boldt (7) endeavors to save a portion of the ovary in performing oöphorocystectomy and in forty-five cases has had only one bad result. The necessity of leaving the ovary with an unimpaired blood supply cannot be overestimated, and if this is impossible an oöphorectomy should be performed. It has been claimed that ovaries which are left behind after the removal of the uterus or the corresponding tube, give subsequent trouble often undergoing polycystic degeneration and becoming enlarged and tender, and sometimes prolapsing into Douglas's cul-de-sac or if this does not occur that they become adherent and painful. Unfortunately, there is no doubt that this is sometimes the case. The authors are, however, of the opinion that the fault in these cases lies not so much in the ovary as in the method of performing the salpingectomy.

The important factors to be considered in conservative ovarian surgery are the maintenance of a proper blood supply and the securing of the ovary in a good position, preferably in its normal location, in the fossa obturatoria (Waldeyer). If these two points are observed, the cystic degeneration of the ovary, the dysperunia, and other distressing symptoms can be averted. Furthermore, this opinion is strengthened by the review of the after histories of engrafted ovaries which almost invariably become cystic. Souve (47), in his recent exhaustive study of ovarian transplantation, finds that cystic degeneration almost uniformly supervenes. This, he believes, is due to an imperfect blood supply. Special attention should also be paid to covering all raw areas so that adjacent organs may not become adherent and by post-operative adhesions cause as much discomfort as the original condition. All rough handling and trauma of the ovary should be avoided during the operation. In those cases in which a resection has been performed especial care should be taken to accurately coapt the cut surfaces of the ovary, but not to constrict the tissue in so doing. The sutures should be so passed that no dead space remains. Absolute hæmostasis should be secured. Martin (30) very properly strongly enforces the necessity of stopping all bleeding points in cases of pelvic inflammatory disease. There is no better culture media than blood clots. In conserving ovaries as in all other forms of surgery, the ability to diagnose pathologically while in situ is of the utmost importance and for this reason we believe surgeons should accustom themselves to study tissue removed with great care.

It is quite as important that the uterus be left in good position as the ovary. If attention is not paid to this detail, the uterus may, by traction on the broad ligament, produce a disturbance in the ovarian circulation or actually drag the ovary into a painful position.

### CONSERVATIVE UTERINE SURGERY

With our increased knowledge of the function of the ovaries and with the cognizance that without these the uterus is a useless organ and that a better support to the roof of the vagina may be obtained by a supravaginal hysterectomy, we believe nearly all operators are agreed on the advisability of performing a hysterectomy whenever a double oöphorectomy is required. Reed (43) has recently pointed out that such uteri, if left behind, are frequently the cause of much pain. Giles (21) found that in sixty-two cases in which a bilateral salpingo-oöphorectomy was performed, the uterus subsequently gave trouble in seven, two required a second operation. Giles (21) presents the following table showing the atrophic results following bilateral salpingo-oöphorectomy.

| | Under 2 years | Under 5 years | Over 5 years | Total No Cases |
|---|---|---|---|---|
| Uterus and vagina normal | 38% | 26.7% | 18% | 17 |
| Uterus or vagina atrophied | 31% | 33 % | 54% | 20 |
| Uterus and vagina atrophied | 31% | 40 % | 27% | 18 |
| | | | | 55 |

This is a further argument in favor of removal of the uterus when it is found necessary to perform a double oöphorectomy.

Carmichael and Marshall (11) found that in young animals when the ovaries were removed the uterus underwent a fibrous degeneration.

### SELECTION OF THE TIME TO OPERATE ON CASES OF PELVIC PERITONITIS

We not infrequently see a case in which the question arises, shall we do a hysterectomy and bilateral salpingo-oöphorectomy and certainly cure the patient of her present trouble, or is it advisable to perform one of the conservative operations? To decide this question, many factors should be taken into consideration, the age of the patient, whether she has a number of children or whether she is particularly desirous of maternity, whether she has to earn her own living by hard manual labor, her social status, and lastly, and almost of paramount importance, the temperament of the individual patient. Even after a careful study of each case and a review of all the points bearing on it, it will be difficult in not a few cases to decide what is best for the ultimate welfare of the patient. The greatest advance in late years in the treatment of these cases is the waiting policy advocated by Simpson (50). This consists in keeping the patient in bed, the judicious use of laxatives and the application of hot sand bags, together with the frequent use of a copious hot vaginal douche. Carl Schindler contends that to account for the large proportion of gonococcal infection above the cervix, the uterus must have some active movements, the gonococci, as is well known, being non-motile. Schindler claims to have demonstrated that the uterus has a well defined involuntary movement not influence by the central nervous system. The administration of atrophin paralyzes these automatic movements. For this reason he recommends its use during the acute stage of gonococcal infection, while Drenkhahn (16) uses atrophin in puerperal infections for the same purpose.

The results of the palliative treatment are often most satisfactory. Large painful tubes resolve themselves into small adherent organs, the ovarian condition subsides and tender adherent masses disappear. By this treatment, a certain percentage of cases can be spared any operation whatever. Prochownick (41) has treated and re-examined one hundred and sixty patients between 1892 and 1905 and claims to have cured 55 per cent by the expectant method, which in his case, consists of rest in bed, applications of ice, which are after a time followed by moist heat, and later by exposure to hot air, the use of the mercury colpeurynter for two to three hours daily and the insertion of a hard rubber cylinder in the vagina at night. Prochownick believes more than one- half of the chronic inflammatory affections of the adnexa can be permanently cured by this method. Henkel (24) states that in 80 to 90 per cent of all inflammatory cases "sub-

jective healing" occurs following judicious non-operative treatment. Olshausen (36) is a firm believer in palliative treatment and in his clinic operations on pus tubes are, if possible, deferred until nine months after the occurrence of the infection and then performed when the temperature is normal. We believe that the majority of gonococcal inflammations of the appendages require operative intervention no matter what form of palliative treatment is adopted, but that a fair trial of such treatment should be instigated in each case and that by this method, better operative results will be obtained than by immediate operation. Under the palliative treatment, the infective micro-organisms in many cases, become innocuous, the uterus and adnexa return, to a certain extent, to the normal. Nature has been allowed to cure as much of the pathology as possible, and when the abdomen is opened we can more easily decide upon the best operation for the individual case. There is no doubt that by the expectant treatment a greater number of cases will be found suitable for conservative operations than if they are at once subjected to operation. Furthermore, the mortality will be reduced. Simpson (50) has recently reported four hundred and seventy-five consecutive abdominal sections for inflammatory lesions of tubal origin, with only four deaths. In addition to the reduced mortality the post-operative results will be improved. It will be found that the operations can be performed with greater speed, and less anæsthesia will be required, a fewer number of hernias, a lessened proportion of infection and consequent post-operative adhesions will be met with. By converting acute inflammatory infections of pelvic origin into aseptic lesions, the mortality will be reduced and the post-operative results bettered. Occasionally cases will be encountered which will not improve under the waiting treatment, but the more carefully these cases are observed, the fewer will be the number requiring immediate operative intervention. Sänger, the skilled pathologist and gynecologist, par excellence, was the first to lay stress on the fact that chronic adherent appendages were not the seat of infection, but merely the derelicts of the gonococcal storm. The cases in which operation should not be delayed, or at least for any length of time, are those in which an abscess can be easily evacuated without traversing the abdominal cavity. Accuracy of diagnosis is the necessary adjunct to this treatment and only by its aid can the surgeon successfully adopt the waiting policy.

### THE CONDITION OF THE VERMIFORM APPENDIX IN CASES OF PELVIC PERITONITIS

Of late years many surgeons, as well as gynecologists, have made a practice of performing an appendectomy in nearly all cases in which the abdomen is opened, regardless of the history of the case and the macroscopic appearance of the appendix. V. Rosthorn (58) has pointed out the fact that there is no other class of cases in which the appendix is so apt to be diseased as in pelvic peritonitis. Pankow (37) has examined one hundred and fifty vermiform appendices from Kronig's clinic which were removed in the course of gynecological operations, and has found one hundred and thirteen diseased. Robb (44) under similar conditions removed two hundred and eighteen appendices and found two hundred and nine diseased. In our laboratory of gynecological pathology, we have three hundred and twenty-seven appendices removed as a coincident to operations for pelvic peritonitis, of these two hundred and seven were macroscopically diseased, while histologically, two hundred and forty-six showed pathological lesions. The entire series present the following results: Normal appendices, 81; peri-appendicitis, 100; chronic appendicitis (various forms), 111; concretion in appendix, 33; primary carcinoma of the appendix, 2. In quite a definite proportion of these appendices, disease could not be detected macroscopically, while neither of the cancers were suspected until the organs reached the laboratory. We believe that in all conservative operations, appendectomy should be performed unless there are unusual operative difficulties or the patient's general condition is such that a few minutes' additional anæsthesia is hazardous.

### IMMEDIATE MORTALITY OF CONSERVATIVE SURGERY

That the radical operations carry with them a higher mortality than conservative operations,

there can be no doubt. The following results from statistics collected from various sources, bear out this statement.

STATISTICS COLLECTED FROM VARIOUS SOURCES

| | Consecutive Conservative Operations | Deaths |
|---|---|---|
| Manton (31) | 100 | 0 |
| Robins (46) | 20 | 0 |
| Simpson (50) | 475 | 4 |
| Giles (21) | 132 | 4 |
| Dudley (18) | 858 | 9 |
| Brothers (8) | 160 | 2 |
| Brown (9) | 10 | 0 |
| Jellett, H. (29) | 32 | 2 |
| Gynecological clinic University Hospital, | 321 | 7 |

An analysis of our seven deaths shows two died of pneumonia, two were nearly moribund at the time of operation, one dying on the table, and the other within a few hours. Both were cases of general peritonitis before operation. One case died of obstruction. One case died of intestinal atony and one case of general post-operative peritonitis.

### END RESULTS OF CONSERVATIVE SURGERY

The chief object to be obtained in all forms of surgery is to cure the patient with as little risk as possible. We have already dwelt upon the possibility of relieving the immediate trouble but by so doing superimposing a worse condition than that from which the patient originally suffered. Although the results may be good at the time of discharge from the hospital it by no means follows that the patient will henceforward incur no ill effects of the operation or have no recurrence of the original disease. The latter possibly is particularly likely in conservative operations for pelvic inflammatory disease. The following are some of the end results obtained in this class of cases by other operators.

Giles (21) cured 120 of 132 cases.

Polak (40) cured 106 of 300 cases.

Robins (46) had 20 cases and cured 20 cases.

In our series comprising one hundred and ninety-one cases, one hundred and forty were cured, forty improved, and eleven showed no improvement. In these cases only such patients were classed as cured as were without symptoms. No cases are included in our series which have been operated on during the past year. This is a very important point in compiling statistics such as these, for by including recent cases many recurrences cannot be known. We have already mentioned the fact that the removal of one ovary has a tendency towards diminishing the amount and duration of menstruation and producing a somewhat earlier menopause than in the case of a patient possessing both these organs. In, however, a certain proportion of cases, in which a unilateral oöphorectomy is performed, menorrhagia or metrorrhagia results. Brothers (8) reports this condition in fourteen of his sixty-six cases. The symptom is usually transitory and is probably due to disturbance of the vasomotor centers and of the entire genital tract, the cycle of which centers round the ovaries. In our series irregular, profuse menstruation was present for a short time in ninety-seven cases, but after one year only nine cases suffered from this condition, while ten additional patients complained of irregularities without mentioning the character of the flow.

### PREGNANCIES RESULTING AFTER CONSERVATIVE SURGERY

One of the greatest advantages of conservative operations over hysterectomy, is the possibility offered these patients of subsequent pregnancy and even the patients who do not conceive, the possibility of childbirth is never positively withdrawn from them. This in itself is an important feature of conservative pelvic surgery. The fact, however, that many of these cases do conceive is well known. Giles (21) found that of his patients who were married and under forty years of age at the time of operation, 25 per cent became pregnant and went to term. The nineteen women who had full term pregnancies, bore, between them, twenty-five children and five other patients had miscarriages, while of our own sixty-eight cases which were married and under forty years of age at the time of operation and in which sterilization was not performed (bilateral salpingectomy), seventeen patients have become pregnant and gone to term, and were delivered of living children. Three of these seventeen patients have had two children each while one has borne three. In none of the labors have anything more than low forceps been

required. A peculiar case of pregnancy, not included in the above group, occurred among our cases and demonstrates the tendency of the Fallopian tube to become patent if simply tied off without excising the intramural portion. This patient was operated upon for double pus tubes of unusual size. Both ovaries were densely adherent and one much enlarged, due to the presence of a retention cyst. Both tubes were removed and the cystic ovary. The patient took her anæsthesia very badly and to save time, the tube was tied off in the old-fashioned way on the side upon which the salpingo-oöphorectomy was performed. The patient had a normal convalescence. Menstruation was regular but rather scant. Two years after her operation, she became pregnant and subsequently gave birth to a full term, healthy child. In the series of sixty-eight cases in which pregnancy was possible in addition to the twenty-two children born, there were seven miscarriages, three of these occurring among the seventeen women who bore children.

Numerous statistics relating to pregnancy following conservative pelvic surgery are on record, but most of these are misleading, as important details, such as the proportion of married patients, the women's age, the amount of time elapsed between operation and compiling of statistics, etc., are lacking.

| | No. Cases Reported | Subsequent Pregnancies | Per Cent |
|---|---|---|---|
| Polak (40) | 240 | 26 | 10 |
| Butler, W. E. (—) | 50 | 1 | 2 |
| Hyde (26) | 21 | 1 | 3.8 |
| Manton (31) | 41 | 6 | 14 |
| Robb, H. (45) | 419 | 0 | 0 |
| Baldwin, L. G. (3) (quoted by Hyde) | 99 | 0 | 0 |
| Dickenson (—) | 50 | 0 | 0 |
| Jewett (29) | 67 | 0 | 0 |
| Brothers (9) | 160 | 0 | 7.5 |
| Brown, G.V.A.(9) | 10 | 1 | 10 |

Dudley (18), after carefully reviewing the after histories of two thousand, one hundred and sixty-eight cases comes to the conclusion that at least 10 per cent become pregnant, while Hyde (26) in summing up a large series of his own and other operators' cases believes that not more than 5 per cent become pregnant. This latter proportion should probably be at least doubled if we take into consideration the age and condition of the patients from whom these statistics are derived, for it is obviously incorrect to compute such instances as women past forty or unmarried spinsters in these results. It is interesting to note that in Polak's series, all of which were at the child bearing age, seventeen of the twenty-six pregnancies followed the abolition of the ovary on one side and the resection of the opposite organ.

### POSSIBILITIES OF EXTRAUTERINE PREGNANCY FOLLOWING CONSERVATIVE OPERATIONS

Giles (21) was one of the first writers to draw attention to the likelihood of ectopic gestation occurring subsequently to a conservative operation of the uterine adnexa. Of his patients, seven subsequently became pregnant extra-uterinely, while Polak (40) reports one cornual pregnancy following a radical salpingectomy. In our series of sixty-eight cases, two women were subsequently operated on for tubal pregnancy. These figures bear out the theory that the chief etiological factor in the production of tubal pregnancy is pelvic peritonitis. If tubal pregnancy is particularly prone to follow conservative operations, and these figures indicate that it is, this factor must be taken into consideration in all conservative operations on married women in the childbearing age.

### PROPORTION OF CASES REQUIRING A SECONDARY OPERATION AFTER A CONSERVATIVE OPERATION

The fact that a very definite proportion of pelvic inflammatory cases subjected to conservative operations require a second operation for the recurrence of an old disease or the further advance of the inflammation into organs hitherto unaffected, is the strongest argument in favor of the radical operation. We have already dwelt upon the frequency in which the gonococcus is found as the infective agent in these cases and also upon its persistence, together with the advantages of the delayed operation, nevertheless, even with the most careful preliminary treatment and prudent selection of cases, a certain percentage of patients will require a secondary operation. Thus:

| | No. Cases Reported | Cases with Secondary Operations |
|---|---|---|
| Polak (40) | 300 | 41 |
| Baldwin (3) | 99 | 1 |
| Jewett, C. (29) | 67 | 6 |
| Dickenson (—) | 50 | 4 |
| Judd (26) | 50 | 2 |
| Manton (31) | 100 | 3 |
| Giles (21) | 52 | 4 |
| Robb* (45) | 419 | 10 |
| Brothers (8) | 85 | 0 |
| Cragin, E. B. (18) | 33 | 1 |
| Clark and Norris | 190 | 7 |

Duhrssen (19) from an experience of 1,000 cases, believes not more than 2 per cent require a second operation.

*Thirteen other cases, however, were under observation for symptoms, ten of which subsequently were cured without operation.

Thus we find that out of 1,445 cases of various operators, 85 or 5.8 per cent require a secondary operation and this is not taking into consideration the fact that many of these cases were not treated by the waiting method before operation. The proportion of cases in which an apparently normal tube becomes diseased subsequent to the removal of the appendages of the opposite side is difficult to state owing to the fact that the majority of the statistics on this subject are based upon such broad grounds. Giles (21) however, has carefully followed the after results of forty-four such cases and in but one did trouble arise. In our seventy-three cases in which operations were performed on one side, the opposite tube being undisturbed, a secondary operation was required five times. In three of the five cases in which a secondary operation was necessary, the case notes show that both tubes were adherent at the time of operation, while in the other two cases no mention is made in the histories as to the condition of the tube.

## CONCLUSIONS

1. It is advisable that almost all pelvic inflammatory cases be subjected to a course of preliminary treatment before operation. By this method, some cases will escape operation entirely while the others can be operated on more easily, more quickly, and with less mortality. A greater number of cases will also be found suitable for conservative operation. If possible four to six weeks of normal temperature and blood counts should precede each operation.

2. If pus be present which can be easily reached without traversing the peritoneal cavity it should be at once evacuated. In a small percentage of cases, the symptoms may be of such a character as to preclude the possibility of any delay. Accuracy of diagnosis and a careful study of the cases will, however, show that the proportion requiring emergency surgery is extremely small.

3. The end results of salpingostomies are disappointing. Pregnancy rarely takes place, as the newly formed ostii quickly become occluded and cause a recurrence of symptoms.

4. Conservation of a grossly normal tube in the presence of diseased appendages on the opposite side offers good results, especially if a course of preliminary treatment has been followed out prior to operation.

5. Conservation of macroscopically diseased tubes is unsatisfactory.

6. Conservative ovarian surgery offers excellent results provided that the ovarian circulation be not impaired and that the organ be left in a good position. This is strikingly exemplified in our series of forty-eight double salpingectomies when one or both ovaries were spared, none of these cases requiring a second operation.

7. In selected cases, ovarian resection offers excellent results. A small amount of ovarian tissue left behind will usually avert the sudden onset of the menopause. The reason many resected ovaries become cystic is because of interference of the blood supply.

8. When it is found necessary to remove both ovaries a hysterectomy should also be performed. Such uteri are useless and often cause subsequent trouble.

9. If it is necessary to remove the uterus, and one or both ovaries can be spared, their preservation will prevent the unpleasant symptoms of the artificial menopause. For although menstruation will cease, the neuroses, which are the worst symptoms of the menopause, will be absent.

## TABLE OF INFLAMMATORY CASES

Our method of obtaining the after results in these cases was to first send a circular letter to each patient. In those cases in which we failed to get a reply a letter was then sent to

TABLE SHOWING THE POST-OPERATIVE RESULTS OF CONSERVATIVE OPERATIONS IN 188 CASES OF PELVIC INFLAMMATORY DISEASE

| | Total | Cured | Improved | Not improved | Menstruation regular, normal | Regular, scant | Regular, profuse | Irregular | Irregular, scant | Irregular, profuse | Dysmenorrhœa | Normal pregnancies | Ectopic pregnancies | Miscarriages or abortions | Neurasthenic before op. and unimproved | Second operation required | Amenorrhœa since operation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unilateral salpingostomy | 2 | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... |
| Bilateral salpingostomy | 2 | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | 1 | ... |
| Unilateral salpingectomy | 18 | 11 | 6 | 1 | 10 | ... | 1 | 3 | ... | 1 | 4 | 2 | ... | ... | 2 | ... | ... |
| Bilateral salpingectomy | 14 | 11 | 3 | ... | 9 | 1 | ... | 1 | ... | ... | 3 | ... | ... | ... | ... | ... | .. |
| Unilateral salpingo-oöphorectomy | 81 | 58 | 18 | 5 | 34 | 14 | 2 | 4 | 6 | 1 | 6 | 14 | 1 | 7 | 2 | 5 | ... |
| Salpingectomy on one side and oöphorectomy on the other | 1 | 1 | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Bilateral salpingectomy. Unilateral oöphorectomy | 58 | 44 | 10 | 4 | 27 | 16 | ... | 2 | 3 | 4 | ... | 1 | ... | ... | 2 | ... | ... |
| Unilateral resection of the ovary | 1 | 1 | ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Bilateral resection of the ovaries | 2 | 1 | 1 | ... | 1 | ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... |
| Supravaginal hysterectomy. Bilateral salpingectomy. Unilateral oöphorectomy | 7 | 7 | ... | ... | ... | 1 | ... | ... | 3 | ... | ... | ... | ... | ... | ... | ... | 3 |
| Unilateral salpingo-oöphorectomy and salpingostomy | 2 | 1 | 1 | ... | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... |
| Totals | 188 | 137 | 39 | 12 | 84 | 33 | 3 | 10 | 13 | 6 | 14 | 17* | 2 | 7 | 6 | 7 | 3 |

*17 patients bore 22 children.

the patient's family doctor. In these letters special attention was paid the condition of the menstrual function, to leucorrhœa, to dysmenorrhœa, and to abdominal pain, pregnancies, miscarriages, operations, or illnesses. Those patients who lived in the city or who did not feel themselves entirely well were asked to return to the hospital for examination. A number of the patients complied with this request, so that, in addition to the reply to our circular letter many of our cases have been personally examined. No patient was classed as cured unless she or her doctor so considered her, nor were any cases viewed as cures unless they were entirely free from pelvic symptoms. Thus, any case complaining of dysmenorrhœa was classed as improved or unimproved according to the severity of condition. As has been shown by the work of Marie Tobler (54), 50–75 per cent of all women suffer more or less at menstrual periods and it seems probable some of our cases which are classed as improved actually compare very favorably with the average woman. No cases were included in our series which had been operated upon during the last year, while some of them are of eleven years' standing. One case of unilateral salpingo-oöphorectomy was well for two years when a miscarriage occurred, infection followed which required a secondary operation. This case was classed as unimproved as was another case of unilateral salpingo-oöphorectomy who was entirely well for thirteen months when trouble recurred requiring a second operation. A case of bilateral salpingectomy and unilateral oöphorectomy was well for two years when, while lifting a heavy weight the patient felt something "give away" in her abdomen, a uterine prolapse resulted, she was classed as unimproved. Following one of the ovarian resections the ovary enlarged to the size of a lemon and gave considerable trouble. Three months after operation, however, it was not palpable and no symptoms were present. Seven years after the operation the patient was menstruating regularly and painlessly. This case was classed as cured. In nearly all our cases a dilatation and curettage was performed together with a suspension operation, in some cases, simple suspension, in others the Gilliam operation, and in the more recent cases, the Coffey operation, while ventral fixation was performed in some of the cases in which both tubes were excised.

Of these one hundred and ninety-one cases, nineteen upon histological examination proved to be tubercular, fourteen of these were secondary to tuberculosis in other parts of the

body. Bilateral salpingectomy was performed in all cases, while in ten cases an ovary was also removed. One case died as a result of a post-operative pneumonia, thirteen were cured of their pelvic symptoms, two were improved, and two have died as a result of their pulmonary condition, one three months after operation and the other two years. Another case was well for nine months, after which tubercular peritonitis developed from which she died.

## PART II

### CONSERVATIVE OVARIAN SURGERY IN CASES OF UTERINE MYOMATA

Omitting those cases in which a myomectomy is possible and advisable, conservative surgery of these neoplasms narrows itself down to the question of the advisability of leaving behind one or both ovaries. In reviewing the points bearing on conservation of the ovaries in conjunction with hysteromyomectomy, a number of points must be considered. First and most important of these is the after history of cases in which one or both ovaries have been spared and the histology of such ovaries some time after the operation.

If a complete operation on both ovaries is performed, an artificial menopause immediately takes place. In the normal woman, the average age at which the menopause appears is 47.89 years and while no definite age can be placed for each indvidual case, recent statistics (35) show that in 79 per cent of cases the menopause does not appear until forty-five years of age. It should also be remembered in considering the question of the menopause, that the actual menstruation is a very insignificant symptom and that the chief feature of the menopause, either artificial or natural, is the nervous phenomena which take place at this time. The actual bleeding is of but secondary importance. The average age at which two hundred consecutive myoma cases came to operation at the gynecological clinic of the University Hospital was 38.35 years. In other words if, by preservation of the ovaries in these cases, it had been possible to avert the artificial menopause which their removal would have caused, each of these women would have probably had 9.54 years more active sexual life even though menstruation was absent.

The question, however, arises, do ovaries which are left behind after the removal of the uterus maintain their function? By a study of the after history of our cases, we are enabled to state positively that they do, at least in the greater proportion of cases. Holzbach (25), on the evidence of a series of cases in which one or both ovaries have been spared, comes to the conclusion that such ovaries not only retain their function, but ovulate regularly for many years. Our results show that, in a few cases, the symptoms of the menopause make themselves manifest in from eighteen months to two years, but, however, the majority go to the normal age for the menopause before the symptoms of the change of life appear other than the amenorrhœa. In a certain proportion of myoma cases, it is possible to amputate high, somewhat above the cervico-uterine junction, and in these cases in which normal corporeal endometrium is preserved, scant but regular menstruation will occur provided that the ovaries have been left behind.

In our series of seventy-five cases in which hysteromyomectomy was performed, and one or both ovaries spared, we have had ten cases which menstruated regularly for periods varying from one to seven years. The chief point, however, is not so much the preservation of menstruation as the avoidance of the neurosis and other symptoms which almost invariably occur after a double oöphorectomy. We have had an opportunity of studying the ovaries from two cases in which conservation of these structures had been adapted after the removal of a myomatous uterus. In both cases but one ovary was left behind and in both the ovary was of entirely normal size and histological study showed no pathological condition present. One of these cases died of typhoid fever three years after the hysteromyomectomy. At the time of her death she was forty-eight years of age and had menstruated regularly until her final illness, while the other case was fifty-four and had menstruated scantily but regularly until forty-six years of age. Carmichael and Marshall (11) find from their experiments on rabbits that in adult life

TABLE SHOWING THE POST-OPERATIVE RESULTS OBTAINED IN 108 CASES OF UTERINE MYOMATA

| | Total | Cured | Improved | Not improved | Menstruation regular | Menses regular, scant | Menses regular profuse | Menses irregular | Menses irregular, scant | Menses irregular, profuse | Amenorrhœa since operation | Age at which menopause appeared in patients who menstruated regularly after operation | Severe symptoms of artificial menopause | Pregnancies | Second operation | Hot flushes, etc., within 1 year | Hot flushes, etc., within 2 years | Hot flushes, etc., within 3 years |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Myomectomy, single | 16 | 13 | 2 | 1 | 11 | ... | ... | ... | ... | ... | ... | ..... | ... | 1 | 1 | ... | ... | ... |
| Myomectomy, multiple | 10 | 7 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | ... | 1 | ..... | ... | ... | ... | ... | ... | ... |
| Myomectomy and unilateral salpingo-oöphorectomy | 7 | 6 | 1 | ... | 5 | ... | 1 | ... | ... | ... | 1 | ..... | ... | 1 | ... | ... | 1 | ... |
| Supravaginal hysteromyomectomy and bilateral salpingectomy | 9 | 8 | 1 | ... | ... | 2 | ... | ... | 1 | ... | 2 | 33 yrs.<br>44 yrs. | ... | ... | ... | 1 | ... | ... |
| Supravaginal hysteromyomectomy and bilateral salpingectomy. Unilateral oöphorectomy | 63 | 59 | 4 | ... | 1 | 7 | ... | ... | 9 | 1 | 39 | 38 yrs.<br>39 yrs.<br>40 yrs.<br>41 yrs. | 1 | ... | ... | 10 | 4 | 9 |
| Supravaginal hysteromyomectomy. Bilateral salpingectomy. Unilateral oöphorectomy. Resection of ovary | 2 | 1 | 1 | ... | ... | ... | ... | ... | 1 | ... | ... | 34 yrs. | | ... | ... | ... | ... | ... |
| Panhysteromyomectomy. Bilateral salpingectomy. Unilateral oöphorectomy | 1 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ..... | ... | ... | ... | ... | ... | ... |
| Totals | 108 | 95 | 10 | 3 | 19 | 10 | 3 | 1 | 12 | 1 | 43 | ..... | 1 | 2* | 1 | 11 | 5 | 9 |

*2 cases, 3 children.

a hysterectomy does not produce degenerative changes in the ovaries. The examination of many of our own cases has confirmed our view that in these cases, if the operation be properly performed, no degenerative changes will take place in the ovaries. Accompanying uterine myomata it is common to find the ovaries hypertrophied, sometimes two or three times the normal size. It is agreed among histologists that with the exception of the hypertrophy, these ovaries are normal. The hypertrophy being confined to the interfollicular portion of the ovary, the ovaries are as actively functionating as normal organs. Kelly and Cullen (28) in their investigation of the ovarian condition accompanying uterine myomata, found that nearly one-half the ovaries were diseased at the time of the operation. The condition found varied from light adhesions to adenocarcinomata. A review of our cases confirms these statistics. Pelvic inflammatory disease of mechanical origin which so frequently accompanies uterine myomata is the usual cause for the adhesions and retention cysts. Few of the cases are of gonococcal origin and for this reason better results may be expected than in true specific infections. It is rather the exception to find a case in which one ovary at least cannot be conserved. We are of the opinion from the study of the work of other operators and from the after results obtained from our own cases that the preservation of one or both ovaries is the operation of choice in all cases of uterine myomata, unless such preservation is contraindicated by a diseased condition of the ovary or the advanced age of the patient. At times cases may be encountered in which both ovaries are found situated so high in the abdomen that although it might be surgically feasible to spare them, their preservation would add materially to the risk of the operation.

Kelly and Cullen (28) in studying the after history of fifty-six cases of hysteromyomectomy in which one or both ovaries had been spared, found that 51.8 per cent of the patients suffered from hot flushes varying in severity and duration. In four of these cases symptoms did not appear until several years after operation, while two of the patients were forty-seven and forty-nine years old respectively when the hot flushes occurred. Kelly and Cullen (28) conclude that the preservation of the ovaries when possible, is of the greatest advantage to the patient

and aids materially in the benefits derived from the operation. Bland-Sutton also urges conservation of the ovaries in cases of hysteromyomectomy, and believes that if only a small portion of an ovary can be spared, the unpleasant symptoms of the artificial menopause will be averted.

Of our seventy-five cases upon whom a hysteromyomectomy was performed and one or both ovaries spared, forty-one ceased to menstruate at once, while nine menstruated regularly but scantily for periods varying from one to six years, eleven bled irregularly and scantily for periods varying from one to three years, while two others were irregular, sometimes profuse and sometimes scant, for one and two years respectively. We have already pointed out that while regular bleeding is the visible sign of active sexual life, the chief symptom of the artificial menopause is not the cessation of bleeding but the neurosis which accompanies this condition after a double oöphorectomy. Of our seventy-five cases but one suffered severely from the artificial menopause, in eleven cases hot flushes were present within one year, in four additional cases within two years, and eleven other cases in three years. In other words, 66 per cent of the patients were entirely free from hot flushes for periods varying from three to nine years. Sixty-eight of the seventy-five cases considered themselves entirely cured by the operation, six were improved, and one, a case of ovarian resection, was unimproved. This patient had been extremely neurasthenic before operation. The ages of the patients comprising this series varied from twenty-nine to forty-three years.

In our series of one hundred and eight cases of uterine myomata, seventy-five were hysteromyomectomies, while the remaining thirty-three cases were abdominal myomectomies. For purposes of study it has seemed wise to exclude vaginal myomectomies from this series, as the tumors removed by the vaginal route are almost invariably single, usually small, and the entire operation differs so radically from the abdominal myomectomy that a comparison is unsatisfactory. Twenty-three of the myomectomies were for single tumors, while ten were multiple. Of the single cases seventeen were subperitoneal, five subperitoneal pedunculated and one intramural, eight of the multiple myomectomies were subperitoneal and two were intramural. Of this series, twenty-six were cured, four improved, and three unimproved. One of the latter patients was well for one year when symptoms characteristic of the growth of another tumor appeared. This patient is under observation. Another patient was without symptoms for eighteen months, at the end of which time a myoma was found springing from the anterior surface of the uterus. In both these cases it is likely that small intramural tumors were overlooked at the time of the myomectomy.

Pregnancy has occurred subsequent to the myomectomy in two cases, one patient bearing two children and the other one. All the labors were easy. Of our thirty-three myomectomies, fourteen were married and under forty years of age at the time of operation. According to these results, slightly more than 12 per cent of myomectomies subsequently become pregnant. No miscarriages occurred in this group. Kelly and Cullen (28) report ninety myomectomies in married women during the childbearing period, of this number fifty-nine had children. These and our own figures, therefore, favor the view that myomata may possibly cause sterility. Twenty-two of our thirty-three myomectomies menstruated regularly following the operation. Amenorrhœa has been present in two cases, while irregularities of the menstrual flow have been noted in three cases.

### MORTALITY

In 213 cases of uterine myomata operated upon in the gynecological clinic at the University of Pennsylvania during the last eight years, in which conservative surgery was practical either upon the uterus or ovaries, there have been eight deaths, four as a result of hysteromyomectomy and four from myomectomy. Among the 169 hysteromyomectomies, one died of œdema of the lungs, one from pneumonia, one from heart failure, and one from peritonitis. The four post-operative deaths occurring among the forty-four myomectomies resulted from the following conditions: Three from peritonitis and one from pulmonary embolism.

## CONCLUSIONS

1. Hysteromyomectomy is the operation of choice in the great majority of cases. Whenever performing this operation upon menstruating women both ovaries should, if possible, be spared. It is of the utmost importance the the operation be so performed that the ovarian blood supply is not interfered with and that the ovaries be left in good position. If it is impossible to carry out these two points with certainty, the ovaries should be removed, as under such circumstances cystic degeneration and other distressing symptoms will arise.

2. By performing a hysteromyomectomy and leaving one or both ovaries, the severe symptoms of the artificial menopause will be averted. If it is possible to amputate across the cervix at such a level as to leave behind corporeal endometrium, scant but regular menstruation will usually follow. Even though amenorrhœa be present the neurosis and other unpleasant symptoms of the artificial menopause will be averted if one ovary be left behind. In a series of seventy-five hysteromyomectomies in which one or both ovaries were spared there was but one patient who complained of symptoms arising from the artificial menopause.

3. Myomectomy is the operation of choice for young women. Its chief advantage over hysteromyomectomy is that the possibility of pregnancy is preserved. Its relative danger as compared with hysterectomy depends on the individual case. Large multiple intramural myomata which make it necessary to greatly mutilate the uterus and to open the endometrial cavity increase the dangers of myomectomy. The presence of inflammatory lesions in the pelvis add greatly to the dangers of infection. Small intramural myomata may always escape detection and by their subsequent growth make a second operation necessary.

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# TOTAL CONGENITAL ABSENCE OF THE VERMIFORM APPENDIX

## A REVIEW OF THE LITERATURE AND REPORT OF A CASE

BY U. GRANT DAILEY, M. D., CHICAGO, ILLINOIS
Formerly Assistant in Anatomy, Northwestern University Medical School; Associate Surgeon to Provident Hospital

UNQUESTIONED instances of total congenital absence of the vermiform appendix in man are so rare that it is justifiable to report such cases if well proven. Some authorities have gone so far as to deny, altogether, the existence of the anomaly.

For example, Lockwood and Rolleston (1) say: "We do not believe that the appendix is ever absent, except as the result of disease. The instances in which absence has been assumed are capable of another explanation."

Kelynack (2) concurs in this opinion, and states: "I have, however, myself never met with any case where the appendix could be said to be absent, except as a result of disease."

The views of these writers are shared also by R. J. A. Berry (3) of Edinburgh, who remarks: "Some authors have described total absence of the appendix. I do not believe, however, that the appendix is ever absent, except as a result of previous excision."

A number of writers on the appendix ignore the subject altogether.

Monks and Blake (4), giving the statistics in reference to the cæcum and appendix from the records of 641 autopsies, do not refer to it. They do mention six cases in which the appendix was represented by a fibrous cord (obliterated appendix).

In 1906, A. P. Heineck (5) analyzed the records of 3,550 autopsies held in the Cook County Hospital with special reference to the appendix without finding a case of absence.

Many of the standard text-books are silent on the matter, and no allusion to it is found in such works as: Deaver's Surgical Anatomy, 3 vols., Campbell's Surgical Anatomy, Eisendrath's Surgical Anatomy, Testut & Jacob, Spaltcholtz, Box & Eccles, etc.

Others mention it scantily. Thus, Cunningham: "Even its absence has been recorded."

Gray, 1909, "It is doubtful if the appendix is ever absent"; leaning to the opinions of Lockwood, Kelynack, and others. It quotes, however, the impression of some investigators that the appendix is absent in 5 out of 10,000 autopsies.

Piersol, 1907 (article by Dwight), "Total absence is extremely rare, but has been observed by ourselves and others."

One should not be hasty in publishing alleged cases of absent appendix, for there are many possibilities of error. Excluding surgical removal, which is usually obvious, the sources of error may be grouped as anatomical and pathological.

### A. ANATOMICAL

1. The appendix may be only partially absent, represented by a shallow pouch or dimple on the head of the cæcum. Cases of this description have been included with those of total absence of the appendix.

2. The organ may consist only of an attenuated fibrous cord without any apparent disease process to account for it. (The physiological obliteration of some authors includes cases of this type.)

3. It may pass but little further than embryonic development (hypoplasia).

4. The appendix, as is well known, may occupy various retroperitoneal positions. Extensive and careful dissection often is required to expose these appendices. Some of the cases

reported from the operating-table as examples of true absence of the appendix would probably fall in this category.

Kelly and Hurdon say they have demonstrated a hidden rudimentary appendix in a case where the organ was claimed to have been lacking.

5. A rudimentary appendix has closely simulated the appendices epiploicæ[1] and *vice versa.*

6. A small vermiform process might be concealed from view in the peritoneal folds about the cæcum, which are well developed in some substances.

B. PATHOLOGICAL

1. Buried by dense adhesions in old inflammations, the appendix is sometimes almost impossible to find.

2. It may be obliterated in suppurative and gangrenous appendicitis. The appendix has been reported to have passed by the anus.

3. Intussusception of the appendix has been invoked as a cause of apparent absence, Marshall and Edwards (6).

It cannot be doubted that a large number of the cases cited in the literature as examples of complete absence of the appendix are supported by insufficient evidence, and must be thrown out. Reports from the operating-table should be accepted with great reserve, for reasons that are obvious.

The following may serve as an example of how impure cases get into the literature.

In a dissertation by Bruegel (7) the statement is made that the appendix was absent (operation report). It was later learned from Merkel, who did the autopsy, that it could not be stated with certainty that its disappearance was not referable to the associated pathologic process.

Significant in this connection is the fact that a large proportion of the alleged cases are reported by surgeons, although anatomists and pathologists have access to an infinitely larger amount of material. It means that thorough dissection eliminates most of the instances of apparent absence.

The sources of error listed above perhaps form a sufficient criterion for the establishment of true absence. Schridde (8), however, thinks it necessary to apply the test of counting the cæcal haustra. In his case (cited below), in which there were present six haustra, he believed the two extra ones represented the appendix. On this ground he would accept none of the previously reported cases as established.

Early literature contains the following references to the subject:

Morgagni, Adversaria Anatomica, vol. 3, 1719, states that the vermiform appendix is not only absent in many animals, but has been found deficient in man.

Massa (Portal histoire de l'anatomie et de la chirurgie, vol. 1, p. 362) reported case of absent appendix while cæcum was perfect.

Hunter reports case of cæcum with no appendix in a right-sided hernia (Leske's Auszüge aus den philosophischer Transactionen, pt. 2, p. 110).

A. v. Haller, Elementa Physiologia, vol. 7, p. 18. Appendix may be rudimentary or even absent ("præcipue casus observarunt, qui ad nostram rem pertinent, dum processum vermiformem partim totaliter deficientem partim parvulum quasi rudimentum aut tuberculum sæpius invenerunt"). According to Zuckerkandl, Haller was the first to report obliteration of the appendical lumen (cited by Merling).

Autenreith, 1906 (Diss. inaug. med.-chir. Sistens observationes in hernias, praecipue intestini coeci, Tübingen), records a case in which "intestinum cœcum herniæ inguinalis saccum, sine ullo processus vermiformis, vestigio, replevit, similem que porro, in quo apud hydropicam fœminam hernia inguinalis dextra intestinum vermiformis continuit." (Cited by Merling.)

J. F. Meckel, 1812, in his Handbuch der Path. Anat., vol. 1, p. 599, states that he found in the cadaver of a woman no trace of the vermiform appendix, although he sought for it most painstakingly and although the surrounding parts were perfectly normally developed and no signs of adhesions presented. The cæcum was of normal size.

Puchelt, 1832, perityphlitis (N. Jahrb. d. deutcher med. und chir., Heidelburg Klin. Annal, vol. 17, p. 534). The case reported in which the appendix was said to have been deficient is manifestly a spurious one under this heading, as the organ was most likely destroyed by the extensive suppurative process.

Gerlach's case (cited by Schridde) also is not an example of total absence of appendix, as that organ was represented by a process 3 mm. in length.

Of these cases the only one that seems fairly authentic is that of Meckel.

In the literature of the past few decades the accounts are more detailed and a number are above criticism.

Several bibliographies mention cases by Tarenetsky (Memoires Acad. d. sc. d. St. Petersbg., 181) and Lafforgue (Journ. Internat. d'Anatomie, 1893), but the originals cannot be found in the libraries of Washington and Chicago.

[1] A case of this kind is reported by Eliot Ellsworth, Reports of the Presbyterian Hospital, N. Y., vol. 3, p. 173.

John Ferguson, 1891 (Am. J. Med. Sc., v. 101, p. 61), observed in 200 dissections with special reference to the appendix, one case in which it could be said to be entirely absent.

J. C. Oliver, 1891 (Cin. Lanc. Clin., vol. 27, p. 203). Autopsy on child, age four, died from intestinal obstruction. There was no connection between intestines at the point corresponding to ileocœcal valve and no appendix could be found. No signs of peritonitis were present, nor was there any fibrous cord connecting the two bowels.

J. D. Bryant, 1893 (N. Y. Med. Journ., vol. lxix, No. 14, p. 508), relates an instance of a girl operated upon in whom there was no appendix. The account is inconclusive.

Zuckerkandl is said to have had an authentic case, but in his article, Über die Oblit. des Darmfortsatz bein Mensch., he deals with obliteration, not absence, of appendix.

Roberts, 1896 (Ann. Surg., vol. xxiii), spoke of a case in which a cæcum in the sac of a right inguinal hernia showed no trace of an appendix, though he could freely examine the point of junction of the three muscular bands.

J. M. Swan, 1898 (Trans. Phila. Path. Soc., vol. 18, p. 38), presents a well studied example in body of a man aged 40. He was careful to exclude previous disease, anomalies of position, and surgical intervention.

Deaver, in the third edition of his book on the appendix (1905), quotes a case of Byron Robinson's in which not only the appendix but the cæcum also was lacking (post-mortem).

He also cites Dorrance as having had a case.

G. Picquard (Bull. Soc. Anatom. de Paris, vol. 68, p. 602) presents specimen of complete absence of appendix. The cæcum was of normal dimensions, 6cm. high, 8 cm. in diameter. No signs of previous diseases or operation. He reviews the literature.

Fawcett and Blatchford, 1900 (Journ. Anat. and Phys., vol. 34, pp. xx-xxv), examined 350 cadavers. Found one specimen showing entire lack of appendix and no signs of inflammation.

Huntingdon (Anat. of Peritoneum and Abdomen, p. 249) describes two specimens of total absence of the vermiform appendix, belonging to the museum of Columbia University.

Jacob Michaux, 1902 (Va. Med. Semimonthly, vol. 7, p. 242), offers two examples from the operating-table. Both were in young females. In one he seems to have fairly established congenital absence of the appendix. The second case is far from being above criticism.

J. M. Dillard, 1903 (Va. Med. Semimonthly, vol. 8, p. 418). This author reports a case in a woman age 30, operated upon for removal of adnexa. Could find no appendix. As far as his account reads the case is one only of apparent deficiency, although he asserts confidently, "This, therefore, is another instance, not of so-called retroperitoneal or hidden appendix but of true absence."

Herman Schridde (*vide supra*) reviews the literature and adds a case of his own. The specimen was from an infant dead of tuberculosis. The cæcum was longer than normal, presenting six haustra. He evidently considered the question closely and although thorough search was made, no trace of an appendix could be found.

Marshall and Edwards (cited above) report a case of "agenesis" of the appendix occurring in a male Filipino, dead from cholera. The case presented no signs of peritonitis, and showed no other congenital anomalies. There was no appendix on gross inspection and microscopically only a rudimentary structure could be found, which extended as a shallow invagination of the mucosa of the cæcum from its lumen, to end between the fibers of the circular muscle of the cæcum.

The following cases of those just recited bear the marks of probable authenticity: Mechel's, Oliver's, Swan's, Fawcett's and Blatchford's, Picquard's, Michaux's (case 1), Byron Robinson's, Huntingdon's (2 cases), Schridde's, and Marshall and Edwards'.

To these I wish to add a case recently observed by me:

In making a routine examination of a body at a local morgue, January 25, 1910, an appendixless cæcum was found. The body was that of a colored man, age 40, who met death by an accident. On noting the apparent absence of the appendix, a careful dissection was made. The three longitudinal bands met in the inner and posterior aspect of the cæcum about 3 cm. below the ileocæcal angle. The cæcum itself was normal in conformation and measured 6.5 cm. in its longest diameter and somewhat less than 6 cm in width.

The ileocæcal intestine was raised, and thorough search made for possible abnormally situated appendix. The serosa was next entirely stripped from the cæcum and ascending colon, to note if a degenerated vermiform process might not be found lodged between the gut and its peritoneum. No such condition could be made out. The interior of the cæcum was explored with great care, but not the slightest trace of an appendix orifice could be found.

The peritoneum was perfectly smooth and glistening, not only in the right iliac region, but throughout the abdomen. No adhesions or abnormalities of any kind were present. Further examination of the abdomen and thorax was made with a view to other congenital anomalies, but such could not be found. Nor was there any semblance of evidence pointing to surgical intervention.

Drs. H. C. Bryant and A. Bailey Williams of this city were present at the autopsy.

Total congenital absence of the appendix is perhaps in the majority of the cases accounted for correctly, as stated by Huntingdon. He assumes that "the embryonic cæcal bud is developed just sufficiently to yield the required pouch, with nothing to spare, which could remain as a rudimentary part, in the form of an appendix" (agenesia).

Marshall and Edwards report their cases of this type.

On the other hand, in some instances it is probable that the appendicular portion of the primitive cæcal stalk simply fails to become arrested in its development, keeps pace with the cæcal portion proper, and at maturity is indistinguishable, as to caliber and conformation from a normal cæcum. Schridde's specimen showing six haustra is very likely an example of this.

A third possibility is that the formed primitive appendix may discontinue growth in early fœtal life (aplasia).

Byron Robinson's case exemplifies, interestingly, the failure to develop of the primitive diverticulum, which is to be the cæcum and appendix.

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# CHOLECYSTITIS COMPLICATING TYPHOID FEVER

## WITH REPORT OF TWO CASES

BY E. M PRINCE, M D. BIRMINGHAM ALABAMA
Surgeon to Hillman Hospital

THE frequency with which typhoid fever is complicated by cholecystitis has excited quite a good deal of interest during the past few years, and has prompted the medical man to a more careful study of his cases in order to be able to appreciate this grave complication when it does present itself. Many cases undoubtedly go on to recovery where the gall-bladder infection is of a mild degree, just as we see many cases of appendicitis recover where the infection is not too severe.

But the condition when confronting us is one that should be watched with great care, and every phase of the case studied, before leaving the case to nature, when the operative mortality is so small as it is at the present day.

In the May 15, 1909, issue of the Journal of the American Medical Association, I reported three cases of cholecystitis complicating typhoid fever operated upon by me without any operative mortality, although one of these cases died on the eighth day from an intestinal perforation, this being proven at autopsy. None of the five cases could have recovered without operation. It was at one time thought that an operation during the course of typhoid fever was almost necessarily fatal, but the keynote to the small mortality in operations upon patients who have long been the subjects of infection of any kind is rapidity in getting in, doing what is necessary and getting out of the abdomen, also, using only gas-oxygen anæsthesia, which does not produce the blood changes, nephritis, and liver toxæmia seen after the use of ether and chloroform.

The gall-bladder seems to be especially favorable for the development of the typhoid bacilli, as they are found here many years after the disease has been supposed to be entirely cured. It would suggest that during the course of the fever any drug that would render the gall-bladder less inviting to the bacillus typhosus would be indicated. Hence the use of urotropin is said by some good clinicians to be of great value in the prevention of this surgical complication, although its efficacy is seriously doubted by others.

As a diagnostic means in this affection the blood is to be relied on more than any one symptom, provided a frequent blood count has been made during the course of the fever. In typhoid fever the leucocyte count is usually low, running from 3,000 to 7,000, which is a difference of 4,000. What would be a high leucocyte count in one case would not be in the other, hence the necessity of knowing what the normal count is in each individual. Where the count is as high as in the two cases reported in this paper, knowing the count previous to the gall-bladder symptoms would not be a necessity.

The prognosis is also to some extent dependent on the leucocytosis, as patients who are able to get up a marked leucocyte count can be relied on to possess quite a good deal of resistance.

Believing that cholecystitis is certainly among the most frequent complications encountered during the course of typhoid fever, I desire to add the two following cases to those already reported.

Case 1. W. E. B. Age 22. Family history is negative. Past history, never sick until present illness, except scarlet fever when a child. Present illness: On October 23d began to feel badly, aching all over, felt very weak. No appetite, slight diarrhœa, and began to have fever. Called in Dr. Nabors, who made diagnosis of typhoid fever. Temperature ran usual course until November 11, 1909, when patient was awakened with very severe pain in region of appendix. This pain came on suddenly, with acceleration of pulse rate, and a drop in temperature below normal. Dr. Nabors was called, and found a leucocytosis, pain in right iliac region, with marked rigidity and other symptoms of perforation. A diagnosis of perforation of intestines was made and operation advised, which was accepted by the patient. The blood examination at this time showed leucocytes 25,000, red blood corpuscles, 4,200,000, hæmoglobin, 70. Widal positive. Urine was negative.

Operation. An incision was made in median line and the small intestine rapidly examined, which showed no symptoms of perforation. The gall-bladder was then examined by palpation and found very much distended. A second incision was made over the gall-bladder, and the enlarged organ partly delivered through the incision. The gall-bladder was thoroughly walled off from the peritoneal cavity with gauze packs, and an incision made into the fundus through which a large stream of pus flowed. Eight or ten stones were removed and some bile was discharged after the first flow of pus. The walls of the gall-bladder were rather thin, and no attempt at adhesions to neighboring organs was found. A tube drain was left in the gall-bladder and a deep drain placed well up under the liver. Culture was made from the gall-bladder, which showed typhoid bacilli.

The convalescence in this case was uneventful, the temperature reaching normal on the eighth day after operation. Bile drained freely for several weeks.

Case 2. S. F. Age 14 yrs. Family history negative. Past history negative, except usual diseases of childhood, and had always been a very delicate girl. Present illness began about three weeks ago with headache and diarrhœa and she has been confined to her bed since November 1, 1909. Her physician was called and diagnosed her case as one of typhoid fever. She ran a typhoid course up to November 9th, when she commenced to have great pain over region of gall-bladder, this pain continuing when brought into hospital. I requested Dr. Lull to see her, and he made a diagnosis of typhoid fever complicated by cholecystitis, and advised operation. Her general condition at this time was not good, being very much emaciated. Her tongue was red and very dry, pulse 130, temperature 104°. Lungs and heart were normal. Her abdomen was very tender and extremely rigid. She was vomiting a greenish fluid. On account of the extreme rigidity, the spleen could not be palpated. The maximum point of tenderness was over gall-bladder. Her leucocytes were 21,000, hæmoglobin, 50. As operation was at once indicated we did not wait for report as to positive Widal, but this was found very positive on examination. Urine was negative.

Operation. Gas-oxygen anæsthesia was used. Made incision over gall-bladder, which was found covered by omentum. The adhesions were easily broken up, exposing a distended gall-bladder. On opening the organ, the walls were found to be much thickened, and it contained a quantity of clotted bile. A tube drain was left in gall-bladder. For three days no bile was discharged, but after this the bile began to flow freely. Patient had a very stormy convalescence, caused principally by a suppurative otitis media, which developed a few days after operation. A culture was made from contents of gall-bladder and a motile bacillus demonstrated.

# DEPARTMENT OF TECHNIQUE

## A NEW TECHNIQUE FOR OPERATIONS UPON THE LIVER

By JACOB FRANK, M. D., Chicago, Illinois
Surgeon to the Columbus Hospital; Consulting Surgeon Michael Reese Hospital

SEVEN years ago I devised a plan for operations upon the liver. It was my aim to establish a method so complete that it would be applicable for any operable case which would necessitate cutting of the liver.

Successful experiments were carried out upon animals and the results published in 1905.

Subsequently the method was employed by other surgeons and myself in dealing with lesions of the liver in man. The results were uniformly satisfactory.

Some of the recent text-books of surgery either are entirely silent about this procedure or give it only passing mention. The technique of this operation has not only passed the experimental stage, but has been successfully demonstrated upon the human.

A high regard for human life and the disposition not to subject it to unnecessary risk, is one of the best assets of the capable surgeon.

This proper respect makes the invasion of what is considered dangerous ground accountable for the hesitancy in attacking surgical problems that are beset with real or imaginary dangers.

The factors of pronounced friability and vascularity of the liver have, in themselves, been sufficient bar to the application of surgical measures for the relief and cure of conditions, which, if existing elsewhere, would be attacked with promptness and confidence.

The results of my experiments, both in incising and resecting the liver in dogs, was presented be-

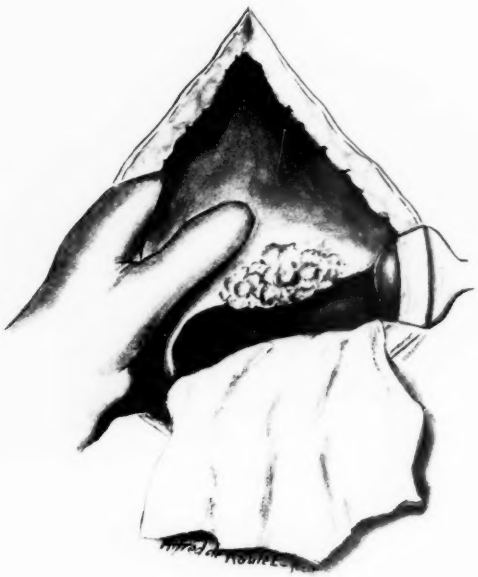

Fig. 1.

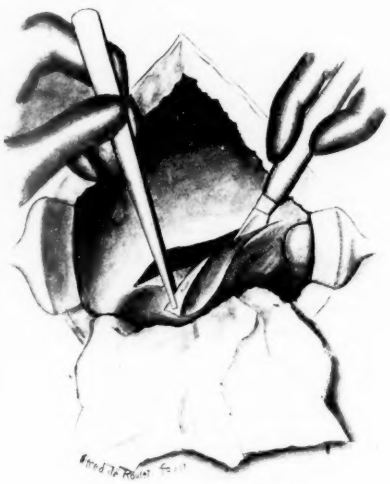

Fig. 2.

fore the Pan-American Medical Congress at Panama in January, 1905, and in July of the same year before the 56th annual meeting of the American Medical Association at Portland. The paper was published in the Journal of the American Medical Association August 12, 1905.

There will be found a review of the surgical procedures involving the liver itself by various men prior to the above date.

While the safety of liver resection has been established, the literature upon the subject leads one to believe that hæmostasis is to be secured by the cautery, previous crushing of the tissue, hot water or steam, or the application of gauze tampon combined with suturing. These are given as the methods of choice by which satisfactory results are obtained.

All of these measures are open to valid objections. The experiments cited, and subsequent operations upon the human, offer a plan by which hæmorrhage is controlled, dead spaces eliminated, and the continuity of the cut liver surface re-established.

Since 1905 only five cases of liver resection by this method have been recorded. The small number of cases reported may be due to unfamiliarity with this technique upon the part of surgeons.

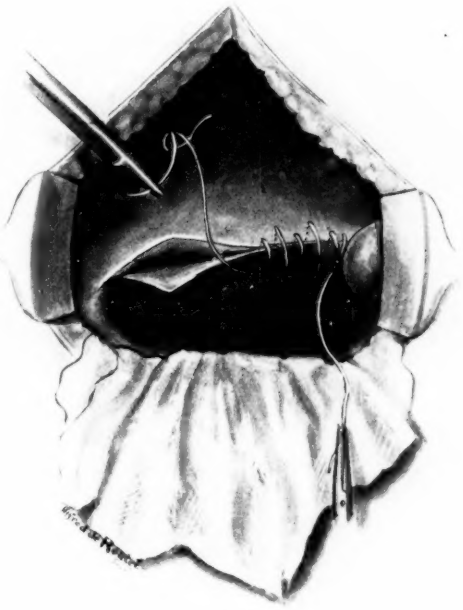

Fig. 4.

Fig. 3.

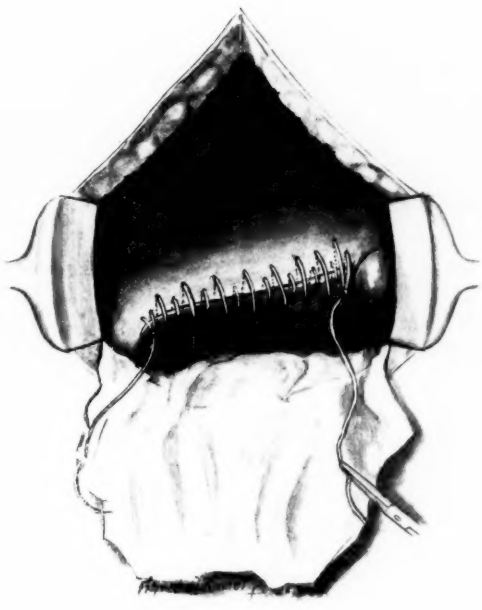

Fig. 5.

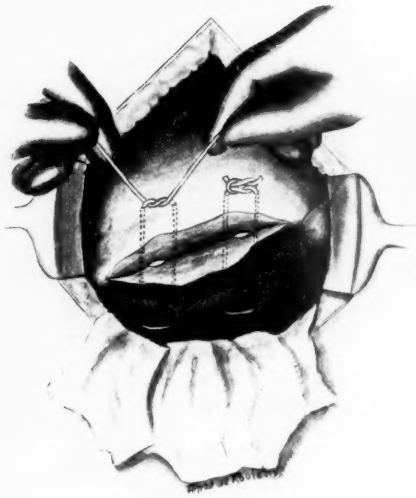

Fig. 6.

This is my reason for again calling attention to this procedure, which has to recommend it, simplicity, minimum disturbance of the parenchyma of the organ, and in clean cases closure of the abdomen without drainage.

In the January issue of Surgery, Gynecology and Obstetrics for 1906, Schroeder of Chicago reports a case of adenocarcinoma of the liver, removed by this method. Schroeder closed the abdomen without drainage. The patient made an uneventful recovery.

In 1907 Professor Garre of Breslau, in his contribution to the late Professor Senn's Festschrift, reported a case in which he successfully employed my technique. February 3, 1909, Dr. Feingold, one of my former assistants, reported to the Chicago Medical Society three cases, two operated by myself, and one by him. The hæmostasis in all of these cases was perfect, and the recoveries uneventful.

Both Schroeder and Garre employed temporary means for the control of hæmorrhage. In neither of my cases, nor the one reported by Dr. Feingold, were any preliminary measures employed for such control.

As a rule, growths of the liver occur more often at or near the lower border (Fig. 1).

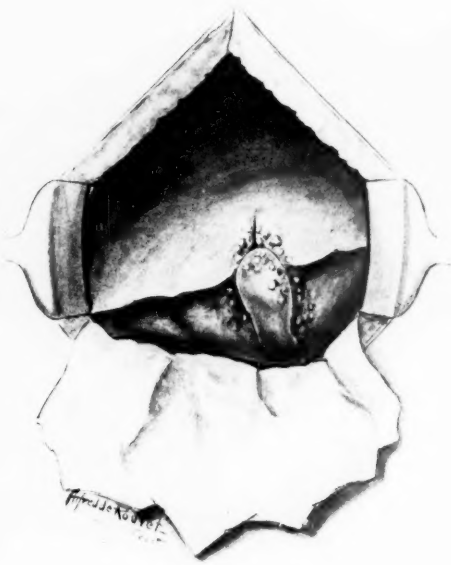

Fig. 7.

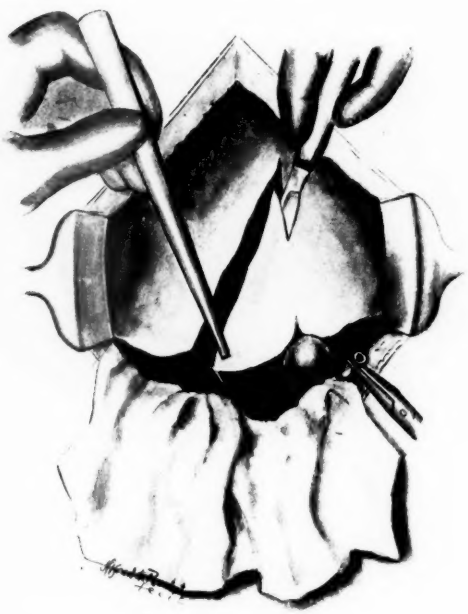

Fig. 8.

The technique is as follows: If the part is to be removed in a transverse direction, the liver tissue is incised on the upper surface, beginning at the healthy border on the hypochondriac side of the growth or injury, carrying the knife around the part to be removed to the border of the viscus on the epigastric side. The incision on the under surface is accomplished in such manner that both will meet (Fig. 2).

If desired the incision may be commenced on the under surface and completed on the upper surface. The portion of liver thus removed by the junction of the two incisions is wedge-shaped, leaving the organ with two flaps forming a trough (Fig. 3).

If the coaptation of the flaps is not perfect more tissue should be cut away, as the perfect apposition of the flaps is essential for the control of hæmorrhage.

Before placing the sutures, the flaps are held together with moderate pressure, that the control of hæmorrhage may be observed. If the bleeding has ceased, a continuous deep suture is taken with a long non-cutting needle threaded with medium heavy catgut. This suture must be placed at the bottom of the trough. The complete coaptation of the edges is now accomplished by a superficial continuous suture (Figs. 4 and 5).

Fig. 10.

Fig. 9.

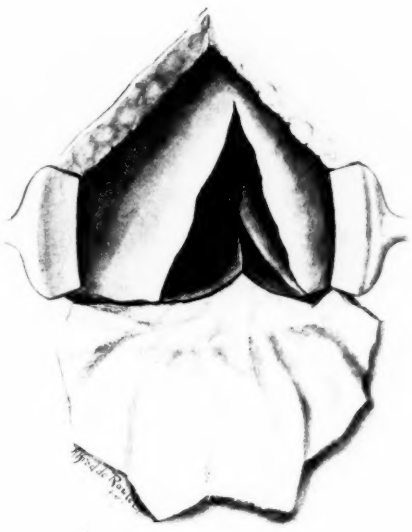

Fig. 11.

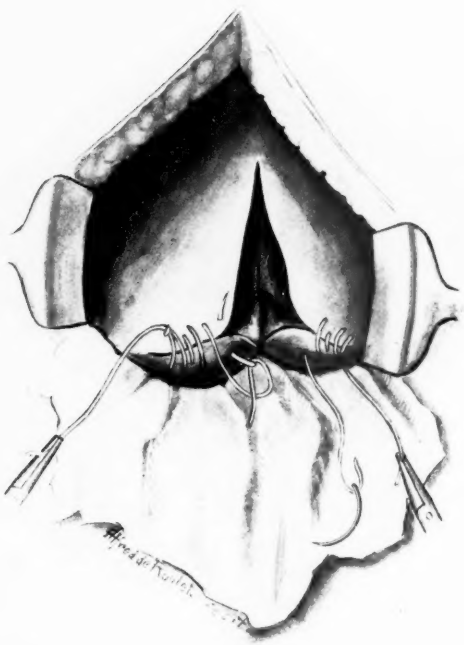

Fig. 12.

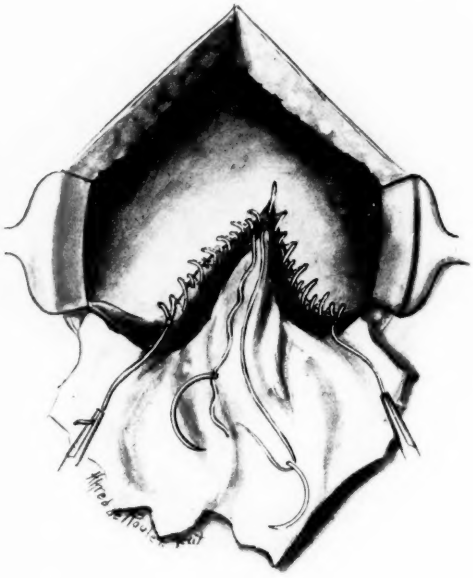

Fig. 13.

The suture may be either continuous or interrupted. The main object is to bring the two flaps together, obliterating all dead space. The continuity of the liver surface is re-established, appearing as if a new border was constructed. No raw surface or ragged edge should be left.

If bringing the flaps together prior to suturing should not control the hæmorrhage, they are separated and the bleeding points noted. If possible these are ligated individually in the ordinary manner. Should the friability of the vessels prevent such ligation, a suture should be carried back of the bleeding point through the entire thickness of the liver and returned in such manner as to surround the vessel. A single knot is now made and gradually tightened until the bleeding ceases. The ligature is secured by taking one or two more knots (Fig. 6).

This ligature may cut its way into the liver, producing slight oozing, which can be controlled by pressure or a superficial suture of fine catgut.

In case the involvement requires the incision to be made in a longitudinal direction to the liver (Fig. 7), the following method is employed. A wedge, including the entire thickness of the organ, is removed, leaving a space, shaped like the inverted letter V (Figs. 8 and 9). These surfaces can not be brought together.

The plan of establishing new borders presenting no raw surfaces is accomplished by excising a wedge from each side of the V (Fig. 10).

With the knife held obliquely to the plane of the two newly created raw surfaces a wedge is excised from each side of the V, thus establishing two troughs (Fig. 11), the sides of which are united in the manner already described (Figs. 4 and 12).

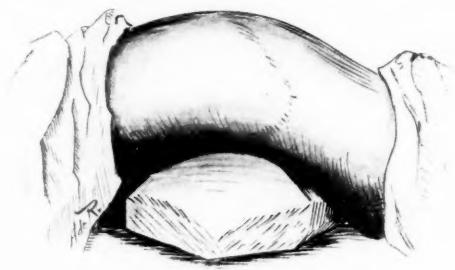

Fig. 14.

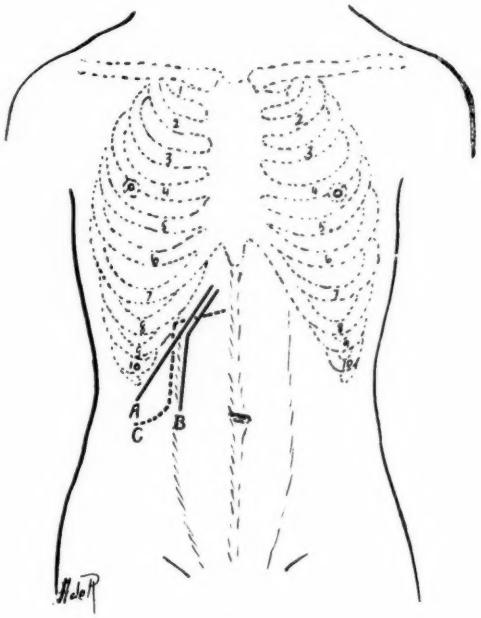


Fig. 15.

When the operation is completed, the raw surfaces of the original V are transformed into smooth, continuous liver tissue, assuming the form of liver borders, the inverted V space permanently remaining as a notch (Fig. 13).

The exposure of the liver is made in the following manner: The organ is rendered more accessible by placing a cushion or sandbag beneath the patient as suggested by Mayo Robson (Fig. 14). The sand bag or cushion may be dispensed with if a modern operating table with an appliance for this purpose is used. If the site to be reached is located in the left lobe, or is undetermined, a median incision should be made. If the right lobe is involved, a curved incision along the lower border of the costal cartilages and to the right of the rectus muscle, as suggested by Kocher, is preferred (Fig. 15A). In some cases a combination of both forming an angular incision as practiced by Mayo Robson, is to be employed (Fig. 15B). In other cases it may be of advantage to use the S shaped incision as suggested by Bevan in gall tract surgery (Fig. 15C).

CONCLUSIONS

1. Clean cut incisions.
2. Perfect control of hæmorrhage.
3. Coaptation of cut liver surfaces leaving no dead spaces.
4. Re-establishment of continuity, with primary union throughout.
5. Closure of abdomen without drainage.
6. No post-operative hernia.

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# CÆSAREAN SECTION UNDER LOCAL ANÆSTHESIA[1]

## With Report of Two Cases

By R. KNIGHT SMITH, M. D., and JACOB SCHWARZ, M. D., San Francisco, California

IN bringing to your attention this operation under local anæsthesia permit me to recall to your memory some of the statements found in our standard text-books on the particular deformities with which we dealt in these two cases.

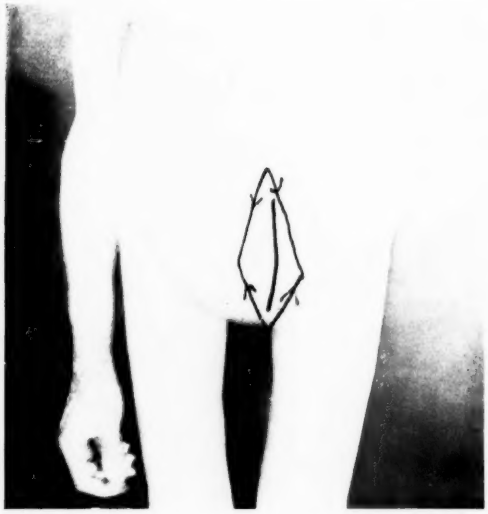
Case 1 was a kyphotic pelvis which according to Klein is very rare, occurring but once in 6,016 labors. The important points in the diagnosis of this condition are: (1) Spinal deformity, the location of the kyphosis in 85 cases reported by Klein was as follows:

| | |
|---|---|
| Dorsolumbar | 24 |
| Lumbar | 17 |
| Lumbosacral | 37 |
| Pelvis obtecta | 7 |

(2) Pelvic measurements, externally the crests of the ilium equal or exceed the bitrochanteric diameter. The anterioposterior of the outlet is shortened, the transverse is narrowed, and the arch of the pubis is more acute. Internally the conjugate vera is usually lengthened. Breuss and Kolinsky in 18 cases found it to vary from 10.7 to 16.5 cm. The transverse diameter is narrowed from above downwards.

The prognosis is variously stated, Klein in an analysis of 175 labors in 95 women states that the maternal mortality was from 6.2 to 17 per cent, depending on the degree of contraction of the outlet and that the fœtal mortality was 40 per cent. Negebauer, in an analysis of 199 labors in 118

[1] Read before the San Francisco County Medical Society, May, 1910.



Triangle indicates lines of injection: perpendicular line shows incision through abdominal wall.

women found that 44 cases ended spontaneously and that the maternal mortality was 24.3 per cent. and the fœtal mortality was 49 per cent (Williams). Wimckel, in 21 cases states that the maternal mortality was 66 per cent, and the fœtal mortality 75 per cent (Edgar).

Giving us an average maternal mortality of 35.75 per cent and an average fœtal mortality of 54.66 per cent.

The treatment in these cases depends on the diameters of the pelvic outlet and particularly on the transverse diameter, which if more than 8 cm. in length we have a number of procedures:

1. Spontaneous delivery of a small child.
2. Induction of premature labor.
3. Instrumental delivery.
4. Operations, such as pubiotomy, Cæsarean section, or craniotomy if the child is dead.

Where the transverse diameter of the outlet is less than 8 cm., the operation of Cæsarean section prior to or at the beginning of labor is the procedure of choice over any of the above.

Case 2 was a generally contracted pelvis, which is stated by Edgar to be the most frequent variety of pelvic deformity encountered in this country, estimating that 2.50 per cent of his cases were of this kind. Williams agrees in the main with this observation, while Müller contends that most of the cases described under this head are usually rachitic in character.

The diagnostic points which call our attention to this condition are: (1) the small stature of the patient; (2) the equal diminution of the pelvic diameters. Williams states that the average measurements in 36 white women were as follows:

| | |
|---|---|
| Spines | 23.25 cm. |
| Crests | 25.7 cm. |
| Trochanters | 26.3 cm. |
| External conj | 17.9 cm. |
| Diagonal conj | 11.1 cm. |

The prognosis in these cases varies with the degree of contraction, Ludwig and Sara stating that intervention of some kind being necessary to end labor in 41.3 per cent of the cases where the true conjugate was 9 cm., and particularly dangerous to the child in breech presentations.

It is in these cases that Williams has urged that the upper limit for Cæsarean section be placed at nine cm. in the true conjugate.

Where possible to have proper hospital care he suggests waiting for one hour after the second stage begins to see if the head will engage, and if at the end of that time there has been no progress, to operate.

Case 1. Mrs. M. E. H., admitted to my service in Lane Hospital, March 16, 1910. Age 35. Native of this city; primipara; housewife.

*Family history.* Father dead, cause unknown. Mother died of uterine cancer. Tubercular history negative.

*Personal history.* Rickets and exanthemata during infancy and childhood. Severe fall and injury of spine at 3 years of age, followed by marked dorsolumbar kyphosis and slight scoliosis (curvature to the left).

Menses began at 18, regular, lasting 3 days, without pain, the flow being scanty. Last menses July 2, 1909, confinement due April 8, 1910. During pregnancy she did not vomit, have headache, dizziness or acidity, but had œdema of lower extremities, constipation, and dyspnœa, the latter increasing as pregnancy advanced.

*General examination.* Height 50½ inches. Weight 90 pounds. General condition poor, muscular development poor, mammary glands very small.

*Lungs.* Bronchial breathing and rales over both apices.

*Heart.* Hypertrophied, mitral regurgitation, rate 120.

*Blood.* March 16, 1910, shows:

| | |
|---|---|
| Reds, 300,000. Hæmoglobin | 60 per cent |
| Whites, 10,800 | |
| Polymorphonuclears | 65 per cent |
| Large lymphocytes | 4 per cent |
| Small lymphocytes | 31 per cent |

Urine amber colored, sp. gr. 1,023, acid reaction, albumen and hyaline casts present.

Abdomen pendulous, hanging nearly halfway on thighs.

Child medium size, head above the brim, occiput to

left pectoneal eminence, small parts in right upper quadrant.

Pelvic measurements:

| | | |
|---|---|---|
| Interspinal | 25 | cm. |
| Intercristus | 26 | cm. |
| Bitrochanteric | 26 | cm. |
| Ext. conjugate | 16 | cm. |
| Interspinal (post.) | 6 | cm. |
| Ant. post. (outlet) | 8.5 | cm. |
| Transverse (outlet) | 6 | cm. |

The internal measurements were not made, as the transverse of the outlet was an absolute indication for Cæsarean section.

The pathologic diagnosis of kyphotic and scoliotic spine, mitral regurgitation, chronic nephritis, pulmonary tuberculosis (?), and a funnel shaped generally contracted pelvis was made.

The physiologic diagnosis was pregnancy at the 37th week of gestation.

CASE 2. Mrs. M. A., admitted to my service in Lane Hospital, April 3, 1910. Age 29, native of India (English parentage); II para; housewife.

This patient arrived in the hospital about 8 P. M., and gave the history of having been in labor since about 9 A. M., the labor pains being in frequent. After a vaginal examination the interne phoned that the head was very high and the cervix dilated about 3 cm. I saw her the following day at 12:30 P. M.

Her family history was negative.

*Personal history.* Rachitic nodes on costal cartilages, menses at twelve years, regular, lasting five days, pain during the first day, flow moderate. One previous pregnancy during which had headache, vomiting, and œdema of legs.

Labor at term of two days' duration terminated by use of instruments; the child stillborn, the husband stating that the child's head was crushed in.

During present pregnancy has had vomiting, headache, œdema, and is constipated.

*General examination.* Height 58 inches, small frame, slight muscular development, heart and lungs normal, general condition good.

Fœtus medium size, head above the brim, back to the left side, fœtal heart in the left lower quadrant, rate, 136.

Vertex presentation, L. O. A. position.

Patient extremely nervous and hysterical, crying, and exhibiting fear over her condition.

Pelvic measurements:

| | | |
|---|---|---|
| Interspinal | 22 | cm. |
| Intercristus | 24 | cm. |
| External conj | 17 | cm. |
| Bitrochanteric | 29 | cm. |
| Right oblique | 20.5 | cm. |
| Left oblique | 20 | cm. |

The obstetric conjugate, as measured with Farabeuf's pelvimeter, was nine cm., and the estimated biparietal diameter of the child's head was ten cm.

*Genitals.* Vulva gaping, old perineal laceration, rectocele, cystocele, vagina medium size, bloody mucous discharge. Cervix centrally placed in pelvis, walls thin and dilated to about eight cm., membranes intact, but ruptured spontaneously two hours before operation.

Promontory easily reached with examining finger and side walls of pelvis noted as being much nearer together than normal.

The pathological diagnosis of generally equally contracted pelvis, possibly rachitic in origin was made.

The physiologic diagnosis of pregnancy at term, labor for 33 hours at time of operation.

The rapid increase of pressure symptoms in case 1 on the heart and lungs, as shown by increasing dyspnœa (the patient being unable to leave her bed) decided for the operation in the last of the 39th week of gestation and prior to the beginning of labor.

The many pathologic conditions contraindicated the use of a general anæsthesia and the conclusion was reached to attempt performing the operation under local anæsthesia.

The situation was explained to the patient and she agreed to the program. In the event of pain at any stage of the operation she was to be given gas and oxygen. With this understanding the usual preparations for an abdominal section were made and the patient brought before the class March 30, 1910, and ten minutes before beginning the abdominal incision local anæsthesia was administered by Dr. Schwarz as follows:

The solution used was a one-half per cent of novocain in normal salt solution, to each ten cc. of which was added one drop of 1 to 1,000 solution adrenalin. This solution was freshly made and boiled for five minutes just before using.

Two points, one nine cm. above the umbilicus and the other a like distance below it in the median line, were infiltrated with a drop of the solution and from these as points of departure the solution was injected about a diamond shaped area subcutaneously and then subfascially. The direction of the injection is best shown by the diagram on the photograph of the abdomen of case 1. The line of the incision was not infiltrated in either of these cases. The amount of the solution used was about 75 cc., in case 1 and 60 cc. in case 2, and it is my belief that a smaller amount might be sufficient.

The operation was carried out as follows: Incision through the abdominal wall 15 cm. long with its center opposite the umbilicus, peritoneal cavity packed off with gauze, uterus incised with knife down to placenta for about an inch and the incision rapidly enlarged with scissors to about fifteen cm., the placenta pushed aside, the membranes ruptured, the child grasped by its feet and extracted and the placenta removed from the uterus while it was in situ; the uterus lifted out of

the abdominal cavity and surrounded by pads dipped in hot saline solution. In case 1, the hand was introduced through the incision into the cavity of the uterus and one finger passed through the cervix, this was followed by Goodell dilator which was carried through the cervix and stretched open. This was not necessary in case 2, operated upon on April 4, 1910, as the cervix was completely dilated before beginning the operation.

The uterine incision was closed deep and superficial interrupted sutures of chromic catgut, and these buried with a continuous Lembert suture of the peritoneum. The peritoneal cavity wiped out and the abdominal incision closed in layers with chromic catgut.

Both children were males, weighed 6 2-16 and 6 3-16 respectively. Respiration began spontaneously, and both babies throve steadily.

During the first day in case 1, there was slight pain in the abdomen with some gas formation and slight nausea, no vomiting. Temperature rose to 100° F. for a short time, and then remained normal throughout the lying-in period. She took water, milk, and broths during the first day and light diet for several days.

Dressings removed on the tenth day, incision healed except a small spot opposite the umbilicus, which had healed a couple of days later. This patient left the hospital against our wishes on the seventeenth day after operation.

During the first day of the puerperium in case 2, the temperature was 98.8° F., and on the second day it rose to 100.4°F., the patient complaining of difficulty in swallowing. There was redness of the tonsils which subsided with the temperature on the fifth day to normal and remained so for the rest of the lying-in period. The dressings were changed on the seventh day and showed the incision to be healed. The patient left the hospital on the twentieth day.

In both of these cases our attention was particularly attracted to the following points:

1. The absolute absence of pain throughout the operation, notwithstanding the dilatation of the cervix from within the uterus in the first case, and the squeezing of the uterus forcibly in the second to see if pain could be produced.

2. The slight loss of blood, though we did not use the rubber ligature or have the broad ligaments. Held by one of the assistants, the fact was so noticeable as to provoke comment from the spectators. It is not contended that the local anæsthesia had anything to do with this part of the operation.

3. Neither of these patients manifested any symptoms of shock, such as seen after this operation under general anæsthesia.

4. The lying-in period was in every respect as normal as after ordinary delivery.

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## ABDOMINAL PALPATION AND AUSCULTATORY PERCUSSION[1]

By THOMAS J. WATKINS, M. D., Chicago, Illinois

THIS paper will not discuss much that is commonly considered in palpation and percussion in the diagnosis of abdominal diseases but will consider some points that have impressed me as being of special interest, namely relative or comparative palpation and auscultatory percussion. The former is of value where the findings seem to be uncertain. By relative or comparative palpation is meant a difference in resistance on direct or conjoined palpation when pressing over an organ, neoplasm or inflammatory mass and when pressing beyond the borders of them, making due allowance for anatomical conditions especially muscular resistance. For example one should not compare the resistance over one of the recti muscles with the resistance to the side of the muscle.

Technique, right kidney. With the hands as shown in Fig. 1, the left hand is pressed up rather firmly and is held stationary. Light vibratory motions are made with the ends of the fingers of the right hand. If the kidney is engaged between the two hands, an impulse is obtained. If the patient is fat, the walls rigid, the examiner inexperienced, or the sense of touch not well developed one may be uncertain whether or not an impulse is obtained. One should then be able to know whether or not an impulse has been obtained by relative palpation, which is performed as follows: a comparison of resistance is made by palpation with the right hand high up where the kidney is usually found and lower down beyond the usual location of the kidney. If a difference in sensation is obtained, one can nearly always be certain that the kidney was between the hands in the one and not

[1] Read before the Chicago Gynecological Society, June 17, 1910.

in the other instance. By this relative palpation one can determine the lower border of the kidney. In Fig. 1 an impulse will be obtained as long as the pressure comes between 1 and 2, and the impulse disappears when the pressure of the right hand falls below 2. It is not essential that one recognize the impulse when pressing between 1 and 2, if one appreciates a difference in sensation when making pressure between 1 and 2 and below 2. By this means one can obtain a fairly accurate idea as to the size and location of the kidney. One should remember, however, the location may change with a change in position of the patient and the kidney may change some in size when displaced. In cases where the findings are uncertain more definite information can often be obtained by attempting to detect a difference in sensation than by endeavoring to obtain a direct impulse. By this method with some practice one should palpate the right kidney in about 99 per cent of women. In conjoined palpation of the right kidney one will occasionally engage the gall-bladder and kidney between the fingers. I recall three cases where a distended gall-bladder containing stones rested upon the kidney as shown in Fig. 2. In each of these cases one could, however, palpate the kidney separate from the remainder of the mass. This is occasionally important in the diagnosis of gall stones. Another condition which may confuse one is an enlongated lobe of the liver extending downwards over the kidney as shown in Fig. 3. I have mistaken this condition twice for an enlarged kidney. One could, however, distinguish one from the other by auscultatory percussion, which will be considered later.

Left kidney. The technique illustrated in Fig. 4 is much the same as for the right kidney. The impulse is usually less distinct than on the right side, for obvious reasons, and can often only be detected by relative palpation, that is, by comparing the sensation upon the fingers when palpating over the kidney and below the kidney. The spleen is often probably a part of the mass engaged between the fingers which gives an "impulse." The kidney can, I believe, usually be outlined separate from the spleen by auscultatory percussion. I am impressed with the great value of relative palpation on examination of the left kidney. Before I had employed it I was seldom able to palpate the left kidney. By means of it I am convinced that it can be palpated in at least 75 per cent of women.

Gall-bladder. It seems to me that too much is usually expected from palpation in the diagnosis of diseases of the gall-bladder. Unless it is so enlarged and firm that it can be obtained by conjoined palpation in conjunction with the kidney,

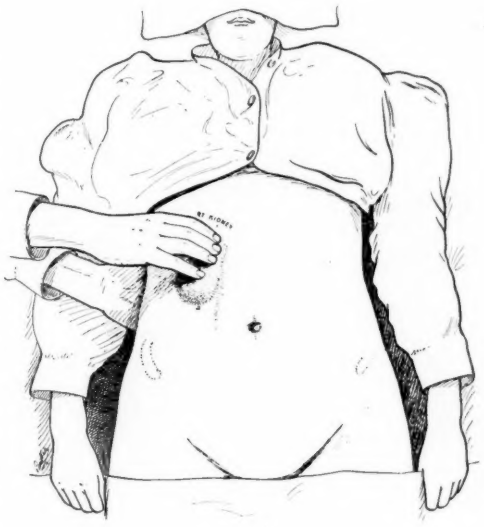

Fig. 1.

it can seldom if ever be detected by abdominal palpation. When it is not thus enlarged, it is not always easily detected after section with the hand in the abdominal cavity. Palpation for tenderness over the gall-bladder is always important and palpation with deep respiration is always advisable.

Appendix. Relative palpation of the appendix is often valuable. Comparison of the two sides is the most important, pressing at corresponding points, that is, resistance over the right rectus should be compared with resistance over the left rectus muscle, and the resistance over the right rectus muscle should be compared to points above and below over the muscle and not to the side. Without appendical tenderness there is more apt to be tenderness on the left than on the right side as the descending colon is inclined to be more sensitive than the ascending colon, especially in cases with colitis. One rectus is probably never more rigid than the other where the organs under them are normal. The recti muscles in normal cases usually give more resistance than the muscles to the side of them. Palpation in cases of appendicitis is chiefly important as regards tenderness and rigidity. Palpation of the normal or slightly enlarged appendix is more a question of imagination than of tactile sensation. In these cases one is impressed with the fact that the appendix in the above condition is not always easily detected after section with the hand in the abdomen.

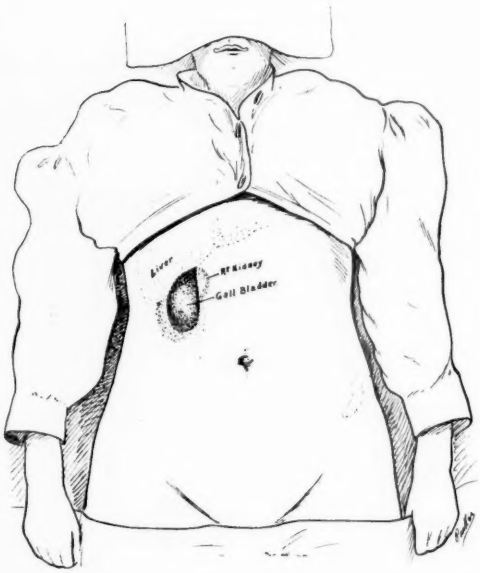


Fig. 2.

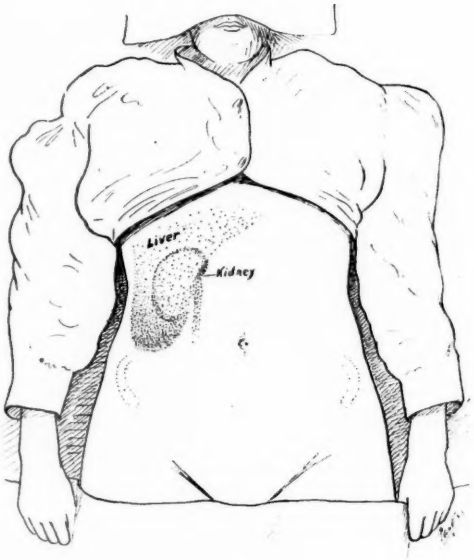


Fig. 3.

In examining for peri-appendical exudates relative palpation is valuable. If the exudate is apparently felt by pressure over the rectus muscle then the resistance should be obtained above and below along the line of the rectus and not to the side. There seems to be a somewhat general impression that one part of the rectus muscle may be made more rigid by contraction than other parts of the muscle. There seems to be nothing in their anatomy or physiology to justify such an opinion.

Pelvic tumors and exudates. By the use of relative palpation one will often detect masses in the pelvis which would otherwise be overlooked. The resistance obtained in one inguinal region should always be compared with the resistance obtained at corresponding points over the other inguinal region. The resistance in the lower abdomen should always be compared with corresponding points higher up in the abdomen. A pregnant uterus with relaxed uterine walls or with a fat abdominal wall may not be detected by simply using pressure over it, but cannot easily escape notice if relative palpation is employed. The same is often true of a distended bladder, thin walled ovarian cyst, and the like.

Auscultatory percussion. Although this is an old method of examination it has never been generally used. I believe it is of great value in some cases. Technique. The stethoscope is placed over the organ to be examined and percussion is made at various points radiating out from the stethoscope. The difference in the sound when percussing at a point over the organ and at a point beyond the border of the organ is easily detected. One has a more distant sound than the other. One may percuss with the fingers but the examination is more delicate when using a metal percusser and plexiometer, as shown in Fig. 5. It is of special value in the examination of solid organs but may be used for a hollow viscus like the stomach.

Fig. 5 shows a method of outlining the size of the stomach. Percussion on coin "A" which is over the stomach gives a "near sound," while percussion over coin "B" outside the border of the stomach gives a more distant sound. The same method is used in examining the solid organs such as the kidneys, liver, spleen, enlarged uterus, and neoplasms. It would seem that the chest wall would interfere much with the transmission of sound in the examination of the spleen, but this is not found to be so, a fact generally appreciated in regard to the chest wall in examination of the heart

Fig. 4.

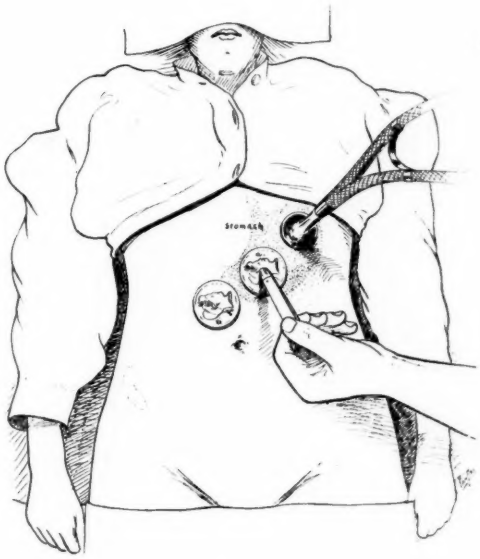


Fig. 5.

and lungs. With the stethoscope over the spleen one can detect the difference in sound when the percussion extends beyond its border and by making dots upon the skin and along radiating lines from the stethoscope one can very quickly outline the spleen. The same is true of the liver and kidneys.

# EDITORIAL ANNOUNCEMENT

## THE CLINICAL MEETING

The reception accorded the preliminary announcement of the Clinical Meeting arranged for the surgeons of North America by the editors of SURGERY, GYNECOLOGY AND OBSTETRICS to be held in Chicago, November 7 to 19, 1910, has been so gratifying that we predict a representative and enthusiastic attendance.

Our arrangements are such that a large number of visitors can be comfortably cared for, both as regards hotel accommodations and the various clinics. By consulting the program (see announcement in advertising pages) it will be observed that a dozen or more important clinics will be in operation simultaneously, and since many of them are in commodious ampitheatres or operating rooms, there need be no fear of undue crowding.

The clinical material is abundant. Every branch of surgery will be represented by a number of clinics. These are to be bulletined daily, twenty-four hours in advance, giving the details of operative procedures or demonstrations. This will allow the visitor to specialize in any branch and to keep himself busy throughout the day in observing work in which he may have a particular interest.

Auditoriums of suitable size and acoustic properties have been engaged for the literary sessions which will be afforded by the medical societies of Chicago, and ample provision made for all visitors to hear and see.

On account of the strictly scientific object of this clinical meeting no effort has been made to provide special social functions for those attending the meeting. Chicago always has many features in the way of sights, instruction, entertainment and amusement, and November is a particularly auspicious time to visit the city for these attractions. Physicians bringing their families will have ample opportunity, since every other evening is left free, to attend the opera, the concerts, the theatres and other places of amusement with them. The ladies, likewise, will find much to interest them in the shopping district, the parks, the galleries, the women's clubs and theatres.

# TRANSACTIONS OF SOCIETIES

## CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD APRIL 15, 1910. THE PRESIDENT, DR. CHAS. B. REED, IN THE CHAIR

### THE CARE OF THE PUERPERAL WOMAN

DR. IRVING H. EDDY read a paper on this subject, which appears in this issue. (See p. 373.)

### DISCUSSION

DR. ROBERT T. GILMORE: I regret that Dr. Eddy did not lay more stress on the aseptic technique to prevent puerperal infection, and on the necessity of making few if any vaginal examinations, depending on abdominal palpation for the determination of the presentation and position.

As to the length of time the patient should remain in bed after a normal labor, I would take issue with him. Ten days to fourteen days seems to be sufficient. During the past two or three years I have not kept any woman in bed for more than two weeks after major pelvic operations. After appendectomies, I frequently have patients get up on the third day, and go home in a week, unless there was some complication.

As to the sutures used in perineorrhaphy, I prefer sterilized chromicized catgut, which will be absorbed in about ten days if properly hardened. Silver wire and silkworm gut which were used at one time, because it was the only material that could be made sterile. The objection to both of these is, they are permanent and have to be removed later.

In regard to the lacerations, I am inclined to think that sometimes you can prevent them and sometimes you cannot. Dr. Jaggard once said that it was malpractice to have a lacerated perineum. I agree with the essayist in immediate repair unless there is some contraindication.

In regard to antiseptics, I think that bichloride of mercury, 1—10,000, is preferable to lysol. Lysol is painful and irritating

As to posture, I begin with the patient lying on the stomach on the fourth or fifth day, and the genu-pectoral position on the sixth, seventh or eighth day.

I do not like the tampon and douche proposition after labor. There is too much chance of infection being carried in by means of tampons until two or three weeks after labor. I do not like Dr. Eddy's method of giving douches, because you cannot sterilize cold water from the cold water hydrant, and it is liable to force water into the uterus. I do not believe that it is good teaching, and it should not go out as having received the sanction of the Society.

As to the use of castor oil, the one place where we are justified in using it is to stimulate the unstriated muscle fibers of the uterus the second day after labor.

DR. FRANK CARY: Surgeons are very careful to get good drainage. The average patient in a private house occupies a bed equipped with box springs and a hair mattress. The weight of the body is from the hips up, therefore, the pelvis sags down and the axis of the vagina is not such as to allow good drainage. My practice is to have the head high enough, so that there is proper drainage from the vagina. These tissues should not be bathed continuously in irritating discharges.

DR. EDDY (closing): I fear Dr. Gilmore did not understand me. In speaking of the prevention of sepsis, I did not dwell at length on that subject, because I did not consider it within the boundaries of this paper, only so far as the after treatment is concerned.

As to catgut, unless it is chromicized, it will not last more than five or six days, and its exposure undoubtedly greatly favors infection.

Relative to posture, he did not understand me as to the time I employed the various positions. I wish to repeat that for the first twenty-four hours, I have the patient assume the dorsal position, to prevent the possibility of an embolism. After that I favor the Sims' position, changing from right to left. It also favors drainage and does not require elevating the head of the bed, although I see no objection to doing so. The knee chest position is assumed after the sixth or seventh day, providing there has not been any other trouble, and is assumed several times daily, for a period of several months.

I advised not to use the tampon before the end of the second or third week and only then in event that involution was not progressing properly, that the uterus was displaced, in which conditions I

favored replacing the uterus and using a tampon instead of a pessary.

I also begin the use of the douche after the period of the possibility of infection has passed, under which circumstances I can see no objection to the direct connection with the bathtub.

CASE OF UNRUPTURED EXTRAUTERINE PREGNANCY

DR. R. W. HOLMES: The patient, a woman twenty-six years of age, menstruated normally May 12th. After the cessation of the period she had crampy pains for a few days. When her period next was due, June 12th, she had profuse hæmorrhages, necessitating tamponade. On examination, her physician found an enlargement of the right tube, which had not been present the previous month; he made the diagnosis of extratube pregnancy, unruptured. Dr. Benson referred the case to me. I show you the unruptured tube with the ovum in situ.

PERIODIC INTERMENSTRUAL PAIN

DR. N. S. HEANEY read this paper. (See p. 361.)

DISCUSSION

DR. J. CLARENCE WEBSTER: I have never been satisfied with any explanation of this condition based upon pathological conditions in the tubes or ovaries. The latter are very common, whereas "mittelschmerz" is comparatively rare. It may be, as was suggested by Dr. Heaney, an abortive attempt at menstruation at the mid-period, although even that theory would not explain why there should be pain, because of the enormous number of cases of menstruation in which there is no pain.

DR. F. A. LEUSMAN: I would like to know whether in this case an exploratory laparotomy would not be indicated always.

DR. GUSTAV KOLISCHER: I cannot see clear logic in the explanations given, because if there are any sclerotic changes in the ovaries or tubes, it would not explain those cases that are normal and where the mittelschmerz disappears spontaneously. It is not very evident why cystic tissue of the ovary should cause pain at the mid-period. Ovarian cysts or tumors cause pain at the time and not at certain periods. Dr. Heaney suggests that this is an abortive attempt at menstruation, but then it would not be very clear why menstruation itself should not be just as painful. Once in a while, operations will relieve the patient for a certain period of time, which might be explained by the eruptive character of the disease. If radical cure, lasting for years at least, had been effected by the operation, it would be different.

The cases which I saw were entirely different, the pain disappearing when the patient was cured of the anæmia. Many girls lose their menstrual pains when their constitutional condition is improved.

Early infection of the uterus as a cause would be shown to be such if the condition was cured absolutely by operation. I do not think that Dr. Heaney's cases are old enough to warrant the theory he has advanced.

DR. EMIL RIES: Mittelschmerz seems to occur less often now than years ago, when we heard much of it in connection with endometritis. The description given by the essayist of the endometrium in his cases could hardly be called descriptive of anything pathologic. The description of one endometrium was simply that of the endometrium immediately after menstruation. Another was simply hyperplasia and not inflammatory, a purely menstrual condition. I remember only two cases of mittelschmerz, and there were no pathologic findings in these. The patients were not operated on and they were lost sight of. I have not seen a single case in the past fifteen years, although there are many cases of menstrual and intermenstrual pain. But if they are questioned carefully they are not always sure that the pain occurs on a certain day. I do not know whether in Dr. Heaney's cases the patients themselves made the statement or whether it was elicited after prolonged questioning.

As to the pathologic findings, there does not seem to be much connection between the pathologic conditions found and the symptoms. Fibroids often cause pain at regular or irregular intervals. Sclerotic ovaries are found in enormous numbers by certain operators, but in proportion to their number the cases of mittelschmerz are extremely rare, so that sclerotic ovaries cannot be regarded as a cause of mittelschmerz.

Curettage seems generally to have proven a failure as it is for dysmenorrhœa of all kinds. The same thing is true of dilatation preceding or accompanying curettement.

DR. HEANEY (closing): In regard to the disappearance of the diagnosis of mittelschmerz, I think it is analogous to the disappearance of the diagnosis of dysmenorrhœa. As more cases are operated on and the underlying pathology is studied more closely, the condition will be better recognized, although it is only a symptom, just as is dysmenorrhœa.

So far as the spontaneous disappearance of pain is concerned, I failed to find any record of such a case in the literature. In one case where the patient changed climate and took baths, the pain was alleviated, but did not disappear.

As far as its being a neurosis is concerned, and amenable to suggestion, there are two cases of interest. The first case was reported by Whitelow. He dilated and curetted, and told the patient that she was cured. The next menstrual period came without pain, but the intermenstrual pain remained. Some months later the woman was operated upon, the uterus was found normal, but she had an ovarian cyst the size of an orange, which was removed. The patient had amenorrhœa for some time, with the relief of the pain. Later menstruation and the mittelschmerz returned. She was treated for some months again but without relief. She returned and was examined. The uterus was the size of an orange and the remaining ovary had increased to the size of a small lemon. It was removed, with permanent amenorrhœa following, and permanent disappearance of the pain. The condition in this case was not benefited by any suggestion, nor by two operations, until the ovaries were removed.

In my first case the suggestion at her first operation was strong. The abdomen was opened for exploratory purposes, and her condition was thought to be an intestinal affair. The appendix was removed and the woman was told she would be well. She went to New Mexico to recuperate and expected complete recovery. The mittelschmerz, however, returned. She was operated on again without any promise as to result. She menstruated at the next regular time, and regularly ever since, the periods being profuse. Here, there was no suggestion of a cure, but her mittelschmerz did not return.

### ABDOMINAL PALPATION AND PERCUSSION

DR. THOMAS J. WATKINS read a paper on this subject. (See p. 425.)

### DISCUSSION

DR. EMIL RIES: I was particularly interested in what Dr. Watkins said about palpation of the appendix. We have heard much about determining the position of the appendix by palpation. There was a gentleman in New York who would palpate the appendix before operation, and he could always tell the direction of the appendix. I have often attempted to follow that method, and I can feel the appendix in a very large number of cases. I can feel it in a large number of cases on both sides, and even after I have taken it out. The location of the appendix is most frequently in a "southeasterly" direction. If one diagnoses that position frequently, the diagnosis is frequently correct, but it is equally liable to be mistaken. That the method is unreliable is shown by the fact that the appendix can be felt on both sides, and that it can be felt after it is taken out. What is it that we really feel? Very often one finds an appendix so extremely small that it is hardly possible that anyone could feel it through the abdominal wall, and in a large number of cases you do not find it where you thought you felt it before operation. When I first started to palpate the appendix before operation I used to say that when I could not feel it, it must be retrocœcal, and in a series of cases that turned out to be correct. I felt certain that my diagnosis was correct. What do we really feel? Is it possible to feel the ureter when it is thickened and the right ureter has much the same direction as the appendix? It is more likely, however, that we feel the edge of the psoas muscle. That it is probably the edge of this muscle is made probable by the fact that we feel it on both sides, and after the appendix is taken out. It is possible to eliminate mistaking the edge of the psoas for the appendix by having the patient move the leg in various positions, which makes the ridge more or less palpable, according to the position of the lower extremity. I would be much interested to hear the experience of others in this connection.

DR. J. CLARENCE WEBSTER: My experience has been much the same as that of Dr. Ries. Fourteen years ago I heard a clinical lecture by one of our most distinguished internists. Never having taken out an appendix or seen one taken out up to that time, I was interested. The lecture was illustrated by a patient and the lecturer spoke of the diagnosis of appendicitis by palpation. He showed on the patient how distinctly he felt the appendix rolling under his finger. Since then I have had a large experience with the appendix, and I have come to exactly the same conclusions as Dr. Ries. In the first place, I think that McBurney's point as indicating the position of the appendix is incorrect. Careful anatomic work shows in over ninety per cent of women, at least, that the appendix lies well below what is termed McBurney's point. I have long since given up trying to make a diagnosis of appendicitis by palpation. In the female it has a very variable position and we ought to admit the fact and not try to hold up palpation as an important diagnostic point in ordinary appendical disease. Even with the hand in the abdomen we often find it difficult to locate the appendix.

DR. HENRY T. BYFORD: A normal appendix cannot be palpated from the outside with any certainty. Anyone who searches for the appendix through an incision in the median line will find it difficult to palpate the organ; therefore, we can not depend on palpation through the abdominal wall. However, when it is diseased there it can

often be felt at or below McBurney's line. In doubtful cases of inflammation I always make a pelvic examination, and if I can feel the ovaries and cannot reach up to the tender area, I conclude it is not the ovary. But when the exudate is felt per vaginam, the doubtful case is usually salpingitis.

There is one thing about palpation as it is done by the general practitioner that is interesting, viz., not a year passes that we do not see cases diagnosed as appendicitis, the patient operated on, and a normal appendix removed, showing that imagination will often overestimate the diagnostic ability.

DR. GUSTAV KOLISCHER: I think it is absolutely impossible to palpate the appendix, except when it is low down in the pelvis, attached to the right tube, as in abdominal palpation you cannot palpate an organ without counterpressure. You can palpate a large tumor by outside palpation, but the counterpressure is given by the tumor resting against the posterior abdominal wall. The same is true of the kidneys. It is absolutely impossible to palpate a normal kidney with one hand. You can only do it by bimanual palpation. If you put the patient in the knee elbow position, you may palpate a normal kidney, although, as a rule, it is impossible. You might feel the lower edge of the kidney. With the patient in the recumbent position, you cannot always feel the kidney, even with bimanual palpation. In cases of old cellulitis you may feel a diffusely outlined tumor, but there may be no symptoms of acute inflammation, and the tumor may be intraligamentous. Simply palpating and making a diagnosis by palpation are entirely different propositions. I do not believe that anyone can palpate an appendix by putting the hand on the abdomen. Many surgeons rely on the statement of the patients and they feel the appendix only because it sounds good to say so.

DR. M. T. GOLDSTINE: The discussion has centered on the appendix, but the main object of the paper, the method of palpating the abdomen has never been lost sight of entirely.

Dr. Watkins spoke of vibratory palpation instead of trying to compress the organ between the fingers. I think we can better outline an organ in that way, especially when the patient is not anæsthetized. Such palpation gives us a great deal more knowledge than palpation by compression. We get a better idea of what we are going to find than when we examine bimanually.

As regards palpating the appendix, I think that in those cases where the appendix has ruptured and an exudate is thrown out, and where the intestines are glued together, you have no trouble in feeling a mass, and you get a good idea as to the cause of the intra-abdominal trouble, and as to how you should start the abdominal operation.

DR. WATKINS (closing): I agree thoroughly with what has been said relative to the appendix. At one time we had a patient in the hospital in whom the appendix was apparently easily palpated. We could determine its size and location. Three or four of us felt it. We opened the abdomen for some pelvic trouble and found that the appendix had been removed. However, there were omental adhesions to the stump of the appendix, and we were rolling a piece of omentum between our fingers.

Another point, I have paid some attention to, is the difference in sensitiveness on vaginal examination in cases of salpingitis, appendicitis, and ovaritis. For instance, in salpingitis and ovaritis there is practically always pain, from pressure on the cervix, and in appendicitis there is usually none, unless the two are associated.

I did not take up the matter mentioned by Dr. Kolischer, because I did not want to extend my paper. The object of the paper was to bring out two points. One was the great importance of relative palpation in uncertain cases, and the other the value of auscultatory percussion.

# CORRESPONDENCE

## A BRIEF DESCRIPTION OF A YEAR OF SPECIAL STUDY IN SURGERY IN EUROPEAN MEDICAL CENTERS

By JOHN LOUIS LOHSE, M. D., F. R. C. S. (EDINBURGH)
Associate Professor of Anatomy, Oakland Medical School, Oakland, California

In planning a course of study abroad in one's chosen subject much thought must be given and many inquiries made as to the particular advantages offered and obtainable in the many different centers where the teaching of the subject in all its phases is made a special feature. Too much stress cannot be laid upon the necessity for this preliminary planning. Otherwise the individual in quest of a higher standard of learning will be hampered by an uncertainty of purpose that will be directly responsible for the loss of many valuable opportunities, much time, and for a feeling of dissatisfaction on the completion of his tour.

A course of study in general surgery with the object in view of making it one's special work necessitates a thoroughness that on due thought is seen to mean the undertaking of an enormous task. It means a thorough study of anatomy, pathology, diagnosis, and operative surgery; and a year is the least possible time in which one can accomplish this.

Having just completed a year of such work under the masters of Europe this means of describing my course suggested itself by the fact that, in the light of the present knowledge and experience, the plan of travel and study outlined was one that could not be changed to advantage were the trip now at its beginning rather than at its end. The plan was to spend twelve months in Europe and the British Isles and about four months in the Eastern states.

Arriving in Vienna, an attempt was made to get an insight into the existing conditions and facilities for study. The number of Americans studying there varies between seventy-five and one hundred and fifty. They are organized into a fairly well conducted society — The American Medical Association of Vienna. All the teaching arrangements are practically made by the society's committees, and at the headquarters — the Cafe Klinik, near the Allgemeine Krankenhaus — a bulletin board is kept where are posted announcements and the "course slips."

Twenty to twenty-four hours are the usual number given to a course. The "course slip" constitutes the notice of a course about to begin; and at the top of it is stated the subject, the instructor, number of hours, number of members allowed in the class and the name of the member of the class managing it. Classes are limited in number from four to ten, and members desiring to enter them sign their names on the blank spaces at the bottom of the slips. If there are more signers than the number allowed by the society's rules, those having been students in Vienna the longest time take precedence over the new arrivals. This ruling at times works a great hardship upon new members and upon those who have a very limited time to spend in study. In this way, they may be debarred from a course that they are very desirous of taking for as long as two, three and even four months. However, the ruling is seen to be a fair one when the other side of the question is considered. Any member of the society can post a course after getting the consent of the teacher and arranging with him all the details. If the new arrival is a good German scholar, his way is made easy; but for him who does not understand the language there seems to be little room during the first one or two months. The courses given in English are mostly in demand, and so the most difficult to find a place in. In order to arrange the schedule of courses to the best advantage, the first months of the time were concentrated on the study of anatomy, pathology, and German.

Surgical anatomy is taught in English by Prof. Tandler. He is reputed as one of the highest authorities on the subject in Europe, and is an excellent teacher. He charges two and a half kronen (50 cents) an hour, limits his classes to ten, and covers the entire subject in a series of courses. He treats of the body regionally, devoting one whole course to a region — the head and neck for instance. For the demonstrations, he uses fresh subjects, of which he always seems to have a goodly supply.

In conjunction with these courses, I spent a number of hours every day in the dissecting room. This privilege may be had on payment of twenty kronen ($4.00) monthly with no limitation put on the amount of material to be used. The time spent on anatomy during those first three months was some of the most valuable in the entire year's study.

Pathology is a subject equally well taught in Vienna. At the Pathological Institute a large number of post-mortem examinations are made every forenoon and much time can be put in there very profitably studying gross pathology by the simple method of observation and the sense of touch. The keen observer and student must perforce learn a great deal in that way with such a display of pathological anatomy before him. It is during these autopsies that specimens are procured for the regular courses of instruction in pathology. The privilege given to them by the law to hold a post-

mortem on every patient that dies in the Allegemeine Krankenhaus coupled with the intense interest taken in the subject, makes Vienna probably the finest place in the world for the study of pathology.

Two courses are given in this subject — one by Professor Cohn in German and the other by Professor Stoerck who speaks English very well and conducts his course in that language. They both have a high rating as pathologists. Too much time cannot be spent with Prof. Stoerck. He is a wonderful teacher; and an hour and a half spent with him thrice weekly on general pathology, and later on surgical pathology, cannot be considered otherwise than time most profitably spent.

He begins his consideration of every series of specimens with a short talk; then, after a short description of each specimen, he passes it around for inspection. For instance, on one occasion he considered the relationship between gastric ulcer and primary carcinoma of the stomach. After his preliminary lecture, in which he expressed his belief that as many as 80 per cent of cases of carcinoma of stomach originate from a healed or unhealed ulcer, he proved his assertion by displaying a series of specimens. In a similar way he gave a talk on the relationship between gall-stones and primary carcinoma of the gall-bladder. An interesting side-light is thrown on this subject by Mr. Lazarus Barlow, of Middlesex Hospital, London, who, as a result of his investigations, claims that the carcinoma is produced by the radio-active property of the stones.

One hour a day was allotted to the study of conversational German three days a week, and the same time to medical German the other three days in the week. This idea was a good one, for, during the latter part of my stay, I was able to join some of the popular courses given in German.

Courses are found posted in medical and surgical diagnosis that cover the subject in a broad way. There are courses in laboratory methods for the examination of the blood, urine, fæces, stomach contents, and secretions as discharged through fistulæ, cystoscopy and ureteral catheterization in conjunction with which are taught the methods of determining the activity of one kidney as compared with the other. Other courses in gynecology, orthopedic surgery, and syphilology are all available.

Under the general heading of clinical diagnosis, Docent Kaufmann gives a splendid course to classes of six. They are given in the hospital wards and selected cases are used. Every member of the class has opportunities for studying and examining patients and he is taught a systematic method of procedure. All signs of primary and secondary importance are pointed out and enlarged upon and points in differential diagnosis are made clear.

Prof. Schlessinger gives a course in internal medicine once a month, in which he demonstrates a series of selected cases in such a way that the student of general surgery gets many valuable ideas that serve as aids in diagnosis.

Dr. Claremont's fame as a teacher of surgical diagnosis makes his course exceedingly popular. His lectures and demonstrations are on cases strictly of a surgical character; and having an abundance of clinical material to draw upon, they are always most interesting. They are mostly abdominal, but opportunities for studying surgical diseases of other regions are not lacking. During the course, he demonstrates fully recognized special measures used as aids to diagnosis, and before it is ended the class will have seen the bronchoscope, œsophagoscope, sigmoidoscope, and other similar apparati used. Many students of surgery in Vienna repeat their courses with Dr. Claremont as many as four and five times.

Two or three courses in cystoscopy and ureteral catheterization are posted every month. They cost 100 kronen ($20) for eighteen hours and are very good. These are the most expensive courses given in Vienna. Practice on the bladder phantom occupies the student's attention until he is familiar with the technique of using both the examining and catheterizing cystoscope. After that, if he has acquired the confidence of the clinician, he is permitted to use the instruments on patients as much as time permits. Two such courses, each under a different instructor, the student will find gives him a very valuable aid in the diagnosis of many surgical diseases of the genito-urinary tract.

For three successive months I was able to spend one and a half to two hours a day in the gynecological clinics. Because of the ability of the instructors and the great number of cases available for examination and study every day, they were hours advantageously spent.

In Professor Lorenz's clinic orthopedic surgery is taught by his assistants. The great number of cases treated daily at that clinic makes it possible to supply an abundance of material for purposes of demonstration during the course. Great stress is laid upon differential diagnosis, made the more impressive by the comparisons of series of cases. The student of orthopedic surgery can here have an abundance of practice in the application of plaster bandages and for studying the principles involved in the treatment of this class of cases.

A course in syphilology by Dr. Oppenheimer is well worth taking, because of the frequency that surgeons have to take syphilis into account both in the diagnosis and the treatment of many surgical cases. The ability to demonstrate the spirochoeta pallida by the Chinese ink method in a very few minutes adds a new factor as an aid to diagnosis in cases of doubtful primary lesions.

Besides getting actual instruction in the above subjects with clinical practice, many interesting hours were spent in the operating theatres. The most useful information to be had in them is obtained by seeing pathological conditions exposed to view. This is possible especially in the gynecological theatres. In the clinics of Professors Hochenegg and von Eiselsberg many of the most formidable operations may be witnessed, such as intracranial tumors, including those of the hypophysis cerebri. Too much praise cannot be given the heads of these clinics for the aseptic technique as practiced by them; but it would be time and money wasted

to go to Vienna to learn operative technique. Their redeeming qualifications are their knowledge of anatomy and pathology. In these two subjects they stand with the best in the world.

There is little choice in the time to visit Vienna, except during the months of July and August many of the university professors are away and the teaching is done by their assistants. However, there are excellent opportunities during those months and so it is really immaterial what time one arrives.

Board and lodging costs from thirty-five to fifty dollars per month, and may be had in pensions where other Americans are staying, or in private families. The latter is to be preferred by him who desires to learn German quickly and thoroughly. The cost of living was about the same in the other European cities that were visited.

One more thing might be said about Vienna as a place for study. The clinics are all within a very few minutes of each other, and so very little time is lost in going from one to the other. For the hard and earnest worker there are opportunities to accomplish a tremendous amount of work, for the operators usually begin at seven-thirty and many of the courses begin as early as eight o'clock. Some of the classes are in session as late as seven o'clock in the evening, and for him who desires, there are night classes.

After these five months in Vienna a pleasant and instructive tour covering a period of six weeks can well be made. It affords an opportunity of visiting the clinics of many prominent surgeons whose names are seen every day by the readers of surgical literature.

Munich has one of the foremost gynecologists of Europe, Professor Döderlein. It is a great pleasure to meet him and visit his clinic. The courtesy and attention he extends to visitors are unsurpassed. His very large, beautifully tiled, and splendidly equipped theatre has all the most desirable features one could wish for. As an operator, he is careful, rapid, and works with an assurance that is his most striking characteristic.

I then went to Zurich where Prof. Krönlein has his clinic, to Lausanne where Prof. Roux is, and finally before leaving Switzerland, to Berne. Here Prof. Kocher has done for Berne what the Mayos have for Rochester, and a few days there were well spent. He is the recognized European authority on goiter, and his methods and technique are followed in all the clinics of Europe. Heidelberg is fortunate in having Prof. Czerny. This grand old surgeon is a most interesting man because of the prominent place he has held in surgical literature. His extreme courtesy and the attention he gave to me make me look back upon the hour spent in his clinic as one of the most pleasant in Europe. Prof. Narrath also operates here. He is a brilliant operator, and, besides seeing him do several abdominal operations, he removed a Gasserian ganglion with remarkable speed and precision. Prof. Rehn at Frankfurt-am-Main does an immense amount of work in his clinic. He is held in great repute as an abdominal surgeon, and his writings on surgery of the cardiovascular system are often quoted.

Berlin was my next stopping place, and during ten days allotted for the stay there, I devoted my entire time to observing the methods employed in Prof. Bier's clinic. All are familiar with his treatment for certain surgical lesions by the artificial production of hyperæmia. Its great value is realized by noting results obtained by its use, and the sanction given it by surgeons all over Europe and Britain. Pathology can be very profitably studied in Berlin under Prof. Pick.

Paris has much to interest the surgeon, and here again I would liked to have remained longer, but time did not permit and my unfamiliarity with the French language acted as a damper on my enthusiasm. Prof. Pozzi, as a gynecologist of high standing, is most pleased to receive visitors to his clinic. As an authority on surgery of the genito-urinary tract, Prof. Albarran is generally recognized. Prof. Tuffier is a general surgeon with a large experience and marked ability. In many gynecological operations, necessitating the removal of healthy ovaries, he transplants them in the subperitoneal fatty tissue. He has now done this in several hundred cases and claims that the vitality of the ovary is maintained, and its function of producing an internal secretion is conserved to such an extent that many of the nervous phenomena attending oöphorectomy do not manifest themselves. His work along these lines is very interesting.

On the journey from Paris to London a visit to Prof. Calot's clinic in a small town a few minutes from Boulogne may be made if orthopædic surgery has a special attraction.

London was now reached and here specialists abound and the English language prevails. The English people are most generous in providing means through which their poor may seek relief from the many forms of disease that afflict mankind, and the large number of hospitals supported by voluntary contribution stand as worthy evidence of their generosity. The most eminent physicians and surgeons in the city constitute the staffs of the hospitals, and they also do the teaching in the schools connected with them. General hospitals are maintained for the reception and treatment of medical and surgical cases, but, besides these, there are found many that are provided for special purposes. In the majority of them the arrangements made for clinical instructions are very good, and opportunities are offered for the study of anatomy and pathology.

There are two courses open to students, the expense of each being about the same. In one, he is permitted to attend the clinics of a number of hospitals that issue a ticket conjointly for a very nominal sum, fifteen pounds for three months. The other course limits time and study, as far as is feasible, to one hospital school, and hours that are not advantageously spent there may be employed in visiting other hospitals. This latter I thought to be the better plan, as by so doing it would enable me to follow cases from the time of the initial examination in the Out-Patient clinic to the time of their discharge from the hospital, and also a more intimate acquaintance with instructors could be made which in itself is surely an advantage.

After looking over the field, Middlesex Hospital

seemed to offer the best inducements. Its clinics are well attended, and so there is ample material to choose from for teaching purposes, and the assistant surgeons that teach in them are very experienced and able men. One of these men, Mr. Kellock, is not only a great student himself, but his faculty of imparting useful information to others makes his clinics very popular. Other good clinicians are Mr Handley, Mr. Murray, and Mr. Taylor. Mr. Handley is highly esteemed by his co-workers, for he has put into practice a number of original ideas that have given most brilliant results, for instance, his work on lymphangioplasty.

In the surgical wards are Mr. Pierce Gould and Mr. Bland-Sutton. As a teacher of the principles and practice of surgery, Mr. Gould represents all that could be sought for. His personality makes him a most attractive man, his excellent judgment is such that only a natural surgical genius and a vast experience could combine to produce, and his ability to make the student think in the right way and come to a proper conclusion, all go together to make Mr. Gould a man much to be admired and sought after. Mr. Bland-Sutton, from the time of his student days up to the present, has done an immense amount of work and study on comparative anatomy and comparative pathology. His book on gynecology and also his writings on tumors have brought him recognition as a man with a vast surgical knowledge.

In the anatomical department there is not the opportunity to dissect that there is in Vienna; but there are many splendidly dissected specimens that can be used to study. Excellent instruction, however, makes it a splendid place to learn the subject.

Mr. Lakin is the pathologist and deals with the subject very thoroughly. Autopsies are made daily, the time being announced on the bulletin board.

During the time not taken up by studies at Middlesex, it was most interesting and instructive to visit the clinics of men who stand at the head of the list of English surgeons. Sir Victor Horsley operates at the National Epileptic Hospital, and he has demonstrated the possibilities of the surgery of the brain and cord in a masterly way. Mr. Arbuthnot Lane has also attained a world-wide reputation as a very able surgeon. He is one of the surgeons at the Children's Hospital, and it is there that he may be seen doing his operation for cleft-palate. He is also on the staff at Guy's Hospital; and there he perfected his technique of bone surgery that gives such excellent results. In cutting down upon, reducing, and fixing together the fragments of a fractured bone, not once does he touch the wound with his gloved hand and instead of using an absorbable material to maintain the fixation, he employs metal plates and screws. He has devised special instruments to facilitate the work and reduce the time of the operation to a minimum. Mr. Lane is more of the type of the American surgeon, and his courteous manner makes it a great pleasure to visit his clinic. Mr. Waugh, Mr. Lane's assistant, is a general surgeon. As a diagnostician of the surgical diseases of children, he stands high. The ease and precision with which he does a tonsillectomy have brought him much fame. He dissects the tonsils from their bed, using special traction forceps, a pair of curved scissors, and dissecting forceps. His method has the advantage of simplicity; it produces but slight hæmorrhage and the tonsil is removed in its entirety. At St. Peter's Hospital, Mr. Freyer does his suprapubic operation for enlarged prostate, and the results he gets speak for themselves. By using a very large drainage tube — three-fourths-inch — for a period of four days, he claims to be able to obviate many of the difficulties that so often arise after the operation. His mortality of six per cent compares very favorably with that of Young of Baltimore. At St. Thomas' Hospital, Balance and Makin do excellent surgery. Mr. Barker at University College does much surgery under spinal anæsthesia and has done much to perfect the technique of producing it. Mr. W. Ernest Miles, at the Gordon Hospital, has perfected an excellent operation for hæmorrhoids that is very commendable. He uses specially devised clamps and No. 16 silk ligatures. Examination of several of his patients from one to five years after operation showed that his method is very efficacious.

Aseptic technique is practiced in its every detail in some of the London hospitals, while in others antiseptic measures are relied upon to insure freedom from infection. Irrigation of wounds, other than abdominal, with strong antiseptic solutions is freely indulged in, and during the course of some operations it is common to see the surgeon and his assistants wading in a depth of bloody water. This, however, I am told, is not seen as often as it was only a couple of years ago. Most of the operators wear rubber gloves, many are now realizing the importance of protecting the mouth and hair, but they all, with very few exceptions, use silk for ligaturing and suturing in every instance. Catgut, silkworm gut and horse-hair are used very seldom by the great majority of London surgeons.

A large part of the best surgery in England is done by the provincial surgeons, and after my three months in London, two months were spent very profitably in visiting their clinics.

In Leeds is the clinic of Mr. Moynihan, well-known by his writings. He is a recognized authority on diseases of the biliary system; and lately he has published some papers on "Appendical Dyspepsia," or, as it is called by Dr. Bryant of New York, "Appendical Gastralgia." Among several operations that I had the pleasure of seeing Mr. Moynihan perform was a cholecystenterostomy in a case of malignant disease of the head of the pancreas. His operative and aseptic technique are unexcelled, and as regards the latter the close observer may well believe him when he says that results warrant him in thinking that he has nothing further to strive for in that direction.

A week was very profitably spent in Liverpool, where Mr. Robert Jones conducts his clinics. He is one of England's most progressive surgeons; he is a strong advocate of American ideas and methods and is most cordial in his welcome to visitors and most thoughtful in his attention to them. Due to certain circumstances, he is now confining his work to orthopedics. His uncle, the late H. O. Thomas, died leaving under his care a well established clinic for all cases included in

that class. He has fulfilled his charge well, for now his reputation as an orthopedic surgeon is far and wide. He is especially interested in the paralyses of the young, infantile and spastic. He has outlined new ideas in his writings on the management of these cases, and they are being generally followed.

To make the tour complete I went to Dublin, visiting Mr. Tweedy's clinic at the Rotunda Hospital, and then to Glasgow, where Sir William MacEwen conducts his clinic. The reputation that the former school has for its obstetrical and gynecological teaching, is a survival of that which it established for itself during years gone by.

After Glasgow came Edinburgh, and there are so many fine students and good workers amongst the surgeons connected with the old-established school in this city that I found six weeks hardly sufficient to take advantage of all the opportunities offered. The clinics are conducted at the Royal Infirmary, and every day most able teachers may be heard expounding their ideas on modern surgery. Among the men of great repute as teachers and surgeons are Professors Thompson and Caird, Mr. Cathcart, Mr. Cotterel and Mr. Miles. Besides these are many others that are excellent clinicians. There is one who deserves special mention, Mr. Stiles. He is the surgeon at the Royal Hospital for Sick Children, and as such he has derived an immense amount of experience. Being a great student and very original in his ideas, he has become a recognized authority on the surgical diseases of children. He also is the translator of Kocher's "Surgery."

Before leaving Edinburgh mention must be made of the Royal College of Surgeons. It conducts quarterly examinations for candidates for the Fellowship. Graduates of the colleges of good-standing in the British Colonies are all qualified to take it, but none of the American colleges are included in the list. So for men with the degree of M. D. it is necessary to take the examination for the licentiateship. Passing it, one is qualified to go up for the Fellowship. The Fellowship examinations are of a high standard, very fair and include the subjects of anatomy, pathology, surgical diagnosis, operative surgery, and an optional subject, such as gynecology. They are written, clinical, and oral, and cover a period of three days, and are good as a test of what one has learned from his study abroad.

# ABSTRACTS OF CURRENT LITERATURE

## DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. BACON, M. D. — HERBERT MARION STOWE, M D
HELIODOR SCHILLER, M. D. — C. G. GRULEE, M. D.

## AN INQUIRY INTO THE PRESENT STATE OF OUR KNOWLEDGE OF ECLAMPSIA

BY J. STUART LAWRANCE, M. D., L. M. (ROT.), GREENSBURG, PENNSYLVANIA
Formerly Clinical Assistant in the Kensington Hospital for Women, Philadelphia

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The etiology of the symptom complex known as eclampsia has been the object, of late years, of an immense and very interesting amount of investigation. The greater part has been carried on by German, Italian, and French researches. The object of this résumé is first, to present in a concise form the more important investigations in their logical sequence, and, secondly, to advance one or two personal observations. The subject will be considered under three heads: First, the Rotunda theory of a general toxæmia; second, the placental theory; third, the Italian theory of a functional abnormality of the glands of internal secretion, with special reference to thyroid insufficiency.

### I. THE THEORY OF A GENERAL TOXÆMIA

The principal exponent of this theory is E. H. Tweedy (1 and 2), of the Rotunda Hospital in Dublin. It is held that eclampsia is a general toxæmia, due to the increased metabolism and a decreased elimination caused by the presence and demands of the fœtus on the maternal organism. The minor defects of metabolism, such as constipation, changes in personal hygiene, deficient exercise during the pregnant state; and organic changes, such as congestion of the kidneys, of the liver and intestines, or actual pathologic conditions, which in the non-pregnant woman might be so slight as not to cause notable symptoms, will raise such obstacles that metabolism in the pregnant woman will be, gradually at first, but towards the end of pregnancy, completely impaired. In this theory the severe headaches, pernicious vomiting, and albuminuria are classified with eclampsia and regarded as having a common cause. Attention is drawn to the curious resemblance of diabetic coma, uræmia, yellow fever, and phosphorus-poisoning to eclampsia in their pathology and symptoms. Pathologically in the alterations of the liver (8), acute hepatitis, necrosis (7), cloudy swelling, or fatty degeneration, in varying degrees of intensity being common to the above group. The kidney in eclampsia is found to be acutely congested or inflamed. Attention is drawn to the enlargement of the spleen. The increased viscidity (7) of the blood and its decreased alkalinity in diabetic coma and the so-called acid intoxications is present in advanced cases of eclampsia, together with increased elimination of ammonia and a corresponding decrease in urea. On the score of similarity in symptoms attention is drawn to the fact that headache, lethargy, pruritis, loss of appetite, nausea, flashes of light, tremors, etc., are common pre-

cursory symptoms of eclampsia as well as of those toxæmias of the non-pregnant; while the convulsions, vomit, delirium, and coma, as well as increased blood pressure, are the acute symptoms common to many toxæmias. Tweedy lays emphasis on the difficulty of differentiating between the convulsions of eclampsia and those of other toxæmias, and the comparative ease with which all of them may be distinguished from the convulsions of epilepsy. The following statistical factors are considered by Tweedy to contribute to the support of the Rotunda theory: 1. Occurs more frequently in multiple than in single pregnancies. 2. In England and Ireland tends to occur when the weather is damp and cold. 3. The birth of the child or its death in utero improves the maternal condition. 4. Albuminuria. 5. The kidney disease subsides and does not tend to recur in subsequent pregnancies. The treatment based on this theory is that known as the conservative or eliminative, and it is held, that as soon as elimination of the waste products of metabolism, especially urine and fæces, can be induced, then recovery is imminent, and further, that in decreasing nitrogenous food and in encouraging active elimination, incipient cases may be overcome. Attention is drawn to the fact that acute yellow atrophy of the liver and pernicious anæmia are more prevalent in pregnant than in non-pregnant women. The Rotunda, since the use of morphia with the eliminative treatment, has lowered the mortality from 27 to 8.22 per cent (Rotunda Reports, 1909-10). Stroganoff, of St. Petersburg, basing his practice on this theory, but differing from it, in the use of chloral hydrate and chloroform to the extent of light anæsthesia, during the convulsions, claims and is conceded a maternal mortality of 6.6 per cent in 400 cases, and a fœtal mortality of 21.6 per cent (3). This theory is based largely on clinical observation and on the analogy the clinical course and pathology of eclampsia exhibit to uræmia, diabetic coma, and other toxæmias, and though little or no actual experimental work has been done in its behalf, yet it is a curious fact that it apparently receives yearly increased strength, by the work done in the laboratory on the others.

### 2. THE PLACENTAL THEORY

This hypothesis had its initiation in the discovery by Schmorl of cellular elements in the pulmonary circulation, and to account for it Veit, Freund, Weichardt, Pilz, Hofbauer, Mohr, and Liepmann carried on experiments which broadened out by degrees and finally developed into the now famous placental theory of the origin of eclampsia. It will be well to note before proceeding to explain this theory, that the various protagonists are not completely unanimous, and also that the development of the investigations has at times been retarded by displays of considerable personal animosity on the part of some of the investigators. There is probably no series of investigations, conducted in the interest of obstetrics, that have been more thorough both pro and con, than these. The investigators themselves are men distinguished in obstetrics, and the investigations have extended from the laboratory to the fields of physiological chemistry, anatomy biology, and the medical clinic, to an enormous extent. There are probably more than 200 investigators. Veit (11) in considering the significance of the presence of cellular elements in the pulmonary circulation of eclampsia, asks first, how to account for them, and, second, for their absence in normal pregnant women. Thus they are the specific pathology of eclampsia while forces are at work in the normal pregnant organism which eliminate these cells before they reach the lungs. His theory is that, by a mechanical means not known, syncytial cells enter the maternal circulation, that in their albumen contain a toxin (cytotoxin) inimical to the mother, which the circulation endeavors to combat by an antitoxin (syncytiolysin). He believes that the toxin is of the nature of a ferment, and that its entrance into the maternal circulation is announced by albuminuria and hæmaglobinuria. Veit introduced placental pulp into the abdominal cavity of rabbits and found that albuminuria resulted. In another series with warmed placental pulp introduced into rabbits in the same manner, there was no albuminuria, which supports the idea of a ferment, and which he considers to be the crucial point in the development of his theory Veit, also Theiss (38). Freund (11) and Weichardt (12) advancing a step in the elaboration of the hypothesis, state that when rabbits are injected with a coarse placental solution there results, in addition to the thrombosis, a toxæmia, the former caused probably by the presence of large fragments of placental cells. To overcome this factor he endeavored to obtain a serum from eclamptic patients (placental) as free as possible from cellular constituents, and since the preparation and laboratory technique has justly played such an important part in all the discussions of this theory, it should be given in this résumé of the whole subject. Thick placental juice, the placenta being freed of blood by irrigation through the umbilical vessels and then macerated, was agitated for twenty to thirty minutes with animal charcoal and then filtered through a Berkefeld filter. A very finely divided serum was thus obtained, containing small cellular fragments visible under the microscope only. In a series of experiments with this serum 0.2 cc. produced symptoms of poisoning of the central nervous system without a trace of embolism or thrombosis, and when heated, this serum was without result. Rabbits were used. In a second series of investigations Freund (13) reproduced the above results, including the thermolability of the ferment, and in addition stated that in those animals in which thrombi were found, no cellular elements were discovered in the thrombi of the pulmonary circulation, simply pure masses of fibrin. In another set of experiments, sera obtained from other glandular organs displayed the same positive results of poisoning, while sera obtained from non-glandular organs was inactive, to his mind because of the lack of a ferment. Technically, he found that the ferment activity increased in these experiments in proportion as the coarseness of the sera was reduced. Falk and Bergell (14), by extremely careful cleaning and intravascular irrigation of eclamptic placentæ, found that the ferment was intracellular, and considered that the

placenta was actually concerned in metabolic functions. Hofbauer (15), as the result of considerable experimentation, the technique of which has been among the few not questioned in this controversy, advanced the theory considerably and widened the field of investigation. The nature of the hepatic degeneration he believed with Schmorl to be autolytic, and in this view is supported by the chemical investigations of Dryfuss (16) to a certain extent. The production of thrombi is due to the by-products of the autolysis, and from this concludes that the liver and kidneys could be greatly impaired before the appearance of the first convulsion. It will be noted that the clinical picture of eclampsia bears out this idea, in so far as it relates to the kidneys. To account for the hæmaglobinæminia and hæmaglobinuria, mentioned by Veit in severe cases of eclampsia, Mohr (14) sought (11) and extracted from human placentæ a hæmolysin in the form of an oleate, probably sodium. The interesting feature of this discovery is the well known work of Faust and Tallquist on the hæmolysin elaborated in the intestinal canal of the botricephalus latus, which produces the severe anæmia of the host. Mohr considers the two to be analogous. Mohr and Freund believe that the maternal blood acts as an antagonist to it and that in normal cases it may have the function of freeing iron from the maternal circulation and rendering it absorbable into the fœtal circulation. Semb (17) claimed to have produced immunity to this hæmolysin. Liepmann (18 and 19), in a series of experiments, found that a ferment was present in the placentæ of eclamptic patients which he could not find in the placentæ of normal cases. His results seemed to show that the ferment while present in placentæ removed soon after the outbreak of eclampsia was not present in those removed late in the disease. In a series of experiments with a serum made from the brains of eclamptics, got no results. In another series in which other organs of patients dead of eclampsia were used, no results. These experiments have been criticised on the score of technique (20), and it is probably true that some of the placentæ used by him were infected before they reached his hands. Again some of his placentæ were preserved in toluol. So in this inquiry his results will not be considered, although it seemed just to mention them. Albeck and Lohse (21) have produced hepatic necroses by the injection of amniotic fluid taken from eclamptic patients, and controlled by that from amniotic fiuid of normal cases. Lichtenstein (22) attempted to corroborate the essential features of the work done by Veit, Freund, Weichardt, and Hofbauer, and carried on a series of experiments, but without success. Except in one particular (the theory of Veit regarding albuminuria) and that only partially, his results and his deductions from them especially were contrary to the placental hypothesis. These experiments in detail were: first series, twelve experiments with a coarse solution of the human placenta. All the animals died in two to eight minutes without however a symptom of eclampsia. Among the sera used were three obtained from eclamptic patients. Autopsy showed distension of all the veins and coagulation of the blood. Thrombi in the lungs in three cases, with fragments of placental cells in the pulmonary vessels. Second series, eleven experiments. Placental solution was freed of visible cellular elements by filtration. Two cc. intravenously injected. All the animals lived. Filtrate at all times contained one four-thousandth per cent albumin Esbach. Third series, eleven experiments with a considerably finer solution. Same quantity used. No deaths. Fourth series, eight experiments. Intravenous injection of a concentrated solution of argilla. All die in two to eight minutes. Fifth series, three experiments. Intravenous injection of filtrate of solution used in series 4. No deaths. Sixth series, six experiments. Intravenous injections of a much finer solution. No deaths. Seventh series. Chalk used, in like manner as in 4, 5, and 6. No deaths.

CONCLUSIONS

The animals in series 1 died of mechanically induced thrombosis, which in turn was induced by masses of large cells present in the sera. When these are filtered out as in series 2, the results are negative. As regards the inactivity of the ferment induced by heating, Lichtenstein considers the experiments of Veit and Freund fallacious, because the concentrated salt solution used by them is capable in itself of shrinking an erythrocyte. Similar results were obtained in using coarse and filtered solutions of inorganic matter such as argilla and chalk. Concludes that deaths here being common only in series 1 and 4, must be due to the only common element, the coarseness of the solution, in other words, to the mere mechanical effect of foreign masses in the blood.

Eighth series. To determine the cause of the albuminuria. Introduction of placental masses into the abdominal cavity of rabbits. Results, a transient albuminuria. Ninth series. Introduction of the filtrate of the above. Results, albuminuria. Tenth series. Introduction of milk and eggs. Results, albuminuria. Eleventh series. The above experiments, but intravenously injected, resulted also in albuminuria. Twelfth series. Argilla introduced in like solutions did not cause albuminuria. Animals used, rabbits. These results are similar to those obtained by Veit, but Lichtenstein attributes it rather to the presence of a foreign unassimilable albumen than to syncytiolysis. In reference to his rejection of Veit's experiments to prove the inactivity of his sera when heated, Sippell (23) found that salt solution tended to increase the pathological process in the kidney. Mathes (24) in his investigations found that death in rabbits following injections of solutions of the placenta in varying degrees of concentration depended solely on the rapidity of the injection. Rapid injection caused death, slow injection did not. Engelman and Stade (25) endeavored to conciliate the difference in the experiments of Veit, Weichardt, and Freund, on the one hand, and those of Lichtenstein and Mathes on the other, in the following manner. Placental sera in varying degrees of coarseness and of quantity, and in varying degrees of rapidity, some slowly, some rapidly, were injected into nineteen rabbits. Seventeen of these rabbits died, for the most part in a few minutes,

as Freund described. Six-tenths cc. of undiluted serum in general sufficed, even when very slowly injected. Serum diluted from 1 : 1 to 1 : 100, with the injection time extended to three-quarters of an hour, caused death in all cases, when they had received an amount equivalent to 0.6 cc. of actual serum. The only two exceptions noted were injected with serum from the same placenta. The sera were in each case prepared according to Lichtenstein's method. In four experiments in which the sera were warmed 50 degrees for half an hour, one died, two were sick, one was entirely unaffected. To answer the question whether death was due to the thrombosis alone, or whether it was due to the additional presence of a toxin as held by Freund, a substance was sought known to hinder coagulation of the blood without producing other untoward symptoms. This after experimentation they found in hirudin and pepton. A mixture of a solution of pepton with the fatal amount of sera for a rabbit, was injected into two rabbits and caused no results, while a control died. A solution of hirudin and fatal amounts of several sera in mice caused no effects, except in two, one of which probably died of an air embolus. Hirudin injected before the injection of sera, produced no effects in some, while others died. Engelman (26) tried hirudin clinically on six cases of eclampsia with favorable but not curative results. He believes that larger doses than he used should be tried. Gave 0.3 gr. by hypodermic, but advises use up to 1.0 gr. Similar results have been published by Dienst, Volhard (27, 28, and 29). In drawing conclusions from this mass of investigation one must hold strictly to the object and end originally laid down. So many interesting and instructing facts have been discovered in the course of this work, that many persons, and even some of the investigators themselves in their enthusiasm, have been caught in meshes of side issues. Now, the essential question to be answered is that laid down originally by Veit. Is the placenta capable of producing thrombi in the pulmonary circulation in which placental cells are found? Are there forces at work in the maternal organism which normally in some way eliminate these cells? A positive answer to these questions will establish indisputably that eclampsia is a disease caused by the placenta. Now, having our attention fixed on the actual question, let us see in how far these investigations answer it. Here almost at the outset we see that the investigations have been turned into a side issue, largely by the results of Lichtenstein's deductions (i. e., into a search for a toxin). However, some of the experiments, those which Veit and Freund originally made, and series 1, 4, part of series 7, series 8, and part of series 10 of Lichtenstein, are of use, and these only in answering the question whether placental cells are capable of producing death with symptoms of eclampsia and whether placental cells are found in the thrombi of the pulmonary circulation. Thus limited, the results of Lichtenstein's experiments, series 1, are found to agree with those of Freund and Weichardt, corroborated by the like experiments of Engelman and Stade. So far the question has been answered in the positive sense. Large masses of placenta have caused death of rabbits with symptoms of eclampsia, and the resulting thrombi in the pulmonary circulation have contained placental cells. But it has been found that organic substances, in themselves harmless, in coarse solutions, produced the same result (Lichtenstein, series 4). It should be remembered that Freund states that the thrombi in his experiments contain masses of pure fibrin only, no placental cells. The manner of the introduction of these masses into the adbomen and intravenous injection is not that which would occur in vito in the human being. Finally, from a clinical point of view the point raised by Tweedy (1) is perhaps of the most importance, and the most difficult to overcome, that is, how to account for those cases of puerperal eclampsia which first manifest themselves three to four days after labor. Bearing in mind the rapidity of the circulation, it does not seem possible that the result of the entrance of placental cells into the maternal circulation could be other than almost instantaneous in its onset, but puerperal eclampsia has been known to occur four days after labor. This has been accounted for by the presence of placental fragments in utero, Latzko (30); on the other hand is the vast clinical experience of retained placentæ whole and fragments, in which eclampsia has not been noted. Again, chorionic epithelioma is not attended with any signs of eclampsia. The answer then to Veit's first question must be in the negative, with the qualification that occasionally eclampsia in a very few cases has been attended by the entrance of placental cells into the maternal circulation. If this line of reasoning is agreed to, it follows that the placenta is not the cause of the ordinary and most numerous cases of eclampsia. There is now left for consideration the side issue unto which most of the experimenters have drifted. Does the placenta produce or contain a toxin or a ferment inimical to the maternal circulation? The positive answer of this question would not entail the acceptance of the placenta as the sole or even as the main cause of eclampsia. It would entail only the acceptance of the placenta as a contributory causal factor, for it is of course well known that many organs produce or contain such ferments and toxins. The question has been answered in a positive sense, especially owing to the work of Engelman and Stade, in which the points of discrepancy between Lichtenstein's and Mathes's technique and that of Freund, Weichardt, Mohr, Hofbauer, and all the others, have been complied with; concisely stated it means that the placenta either contains or manufactures a ferment which renders the maternal blood toxic and is capable of producing death of rabbits. This view is corroborated by most of the following investigations, among which those of Graf and Landsteiner have, for thoroughness, reached the highest point in all the work done so far. Rummo (31) compared the activity of normal and eclamptic bloos sera in rabbits by intravenous injections. Results, 6 to 7 cc. per kg., animal weight. Eclamptic sera, fatal. Ten cc. per kg., animal weight, normal sera, fatal. 3 to 6 cc. per kg., animal weight, eclamptic sera, fatal; normal sera, negative results, Tarnier and Chambrelant (32). Bar and Renon (33), results,

4 to 6 cc. per Kg., animal weight, eclamptic sera, fatal. Ludwig and Savour (34) results, 6.5 cc., fatal. 9 cc. normal sera, fatal. Volhard (35) found no difference in his results with normal and eclamptic sera, and Shumacher (36) reached the same conclusion. Graf and Landsteiner (37) in their experiments used rats. The sera slightly warmed were intraperitoneally injected in each case. Results are arranged in five series.

First table. The blood serum of eclamptic patients, 19 sera. 75 experiments. 64 died, 11 lived. Average dosage causing death, 6.9 per cent of weight. Actual fatal amounts varied from 2 to 10 per cent of weight.

Second table. Control of above. Serum from normal blood used. 13 sera, 22 experiments. In this series only one rat died and it received 15 per cent of its weight. All amounts up to 12 per cent of weight were inactive. Fatal dosage of normal sera would hence appear to be above 12 per cent of weight.

Third table. Sera obtained from the retroplacental blood of normal cases. 40 sera, 53 experiments. 29 rabbits lived, 11 died (one caused probably by trauma, free blood found in abdominal cavity). Average dosage borne without result was 15 per cent of weight, although deaths resulted from 11 per cent, 12 per cent, and 13 per cent. Largest amount borne without result, 18.2 per cent.

Fourth table. Sera obtained from blood of various diseases during venesections, among which were uræmia, acute and chronic nephritis, asthma, and apoplexy. Nearly all of the rats died. The only one that lived was injected with serum obtained from blood of a case of apoplexy.

Fifth table. A series of various animal sera were used, obtained from a horse, hen, cats, bulls, rabbits, and pregnant animals. One rat died from bull serum, but four others lived who had received smaller doses. Two died from the effects of serum from pregnant beasts. The rest all lived. Comparing the controlled results of table 1 with table 3, and especially table 4, he logically concludes that the blood in eclampsia is much more toxic than the normal blood, but that this toxicity is not peculiar to eclampsia.

### 3. THE THEORY OF A FUNCTIONAL ABNORMALITY OF THE GLANDS OF INTERNAL SECRETION, WITH SPECIAL REFERENCE TO THYROID INSUFFICIENCY

This theory is largely of Italian origin, although its most thorough advocate is Massini (4) of Buenos Aires, who advances the "combined theory" as follows. A toxin (6) is present in tthe maternal circulation during pregnancy which under certain circumstances becomes pathologic. Granted that such a toxin is present, in the maternal blood, then there should be some organ whose function it is to combat it. The function of the thyroid has been demonstrated, by many investigations of late years, to play a more or less prominent part in protecting the body from such metabolic poisons. It would seem that, granting these premises, the thyroid is concerned in protecting the pregnant woman from eclampsia, and that its insufficiency would cause such a considerable increase in the toxin circulating in the blood as to cause the eclamptic onset. This toxic element of the theory is probably identified with that supported by Veit, and has been discussed in another place. To demonstrate, however. the reality of the thyroid control, Massini removed the thyroid from fifteen pregnant bitches, in most cases totally, in a few partially. The bitches were near to full term. The results were that eclampsia followed in all but two. One of these latter was discovered not to be pregnant. Shortly before the death of one of the eclamptic dogs, 100 gr. of blood were removed, and the serum obtained injected into three dogs with the following results:

1. A non-pregnant normal bitch, without any symptoms of eclampsia resulting.

2. A non-pregnant bitch in whom the thyroid had been removed. Results, symptoms slightly resembling eclampsia.

3. A pregnant bitch near full term. Results, pruritis at seat of injection, only.

In reviewing these very interesting results it may be pointed out that in the one unexplained case of failure of a resulting eclampsia, the failure may have been due to the presence of accessory thyroids. In one such experiment which I was enabled to carry out through the kindness of Professor Ott, of the Physiological Department of the Medico-Chirurgical College, the result was indeterminate. No signs of eclampsia, not even marked tetany, ensued, but the bitch was prematurely delivered of a litter six days after the thyroid was removed. The litter itself was decidedly premature. On the other hand, it has been denied that removal of the thyroid resulted in eclampsia. Seitz (5) removed the parathyroids, but failed to obtain eclamptic symptoms, although he observed tetany. He thinks that tetany has been mistaken for the convulsions of eclampsia. It should, however, be noted that he removed the parathyroids only. Fromme (39) reports fatal tetany following thyroidectomy and that the implantation of the placenta after partial thyroidectomy caused marked symptoms of toxæmia. This result is especially interesting in connection with Massini's theory. To be, however, of positive value it should be further controlled by the implantation of fragments of other organs. Nuti (9) reports two cases of eclampsia which he treated with parathyroidin, one died, one recovered; and Kaiser (10), 1 case with recovery.

### CONCLUSIONS

We have then proof that the placenta is a contributory factor in the etiology of the symptom complex of eclampsia. Thereby one more positive point is added to the Rotunda theory of a general toxæmia, while the combined theory of Massini is disproved in part, in so far as he postulates Veit's placental theory as the sole causal factor. It would seem that the second part of his theory, that in which the thyroid is considered as the antagonist of the invading toxin would still be applicable if it were considered as the antagonist of a general toxæmia to which a toxin from the placenta contributed. And this is probably the trend that future work on this subject will take.

# ABSTRACTS OF CURRENT LITERATURE

## DEPARTMENT OF SURGERY

UNDER THE CHARGE OF


FREDERIC A. BESLEY, M. D.

GEORGE E. BEILBY, M. D. — WM. R. CUBBINS, M. D. — AIMÉ PAUL HEINECK, M. D.

WM. C. DANFORTH, M. D. — FREDERICK G. DYAS, M. D. — G. T. COURTENAY, M. D.

FRED C. ZAPFFE, M. D. — JAMES F. CHURCHILL, M. D. — B. J. O'NEILL, M. D.

ARTHUR B. EUSTACE, M. D. — JOHN A. WOLFER, M. D. — H. A. POTTS, M. D.


**The Inflammatory Nature of Stenosis Caused by Muscular Hypertrophy of the Pylorus** (Sur la Nature Inflammatoire de la Stenose Dite Par Hypertrophie Musculaire du Pylore). WEILL and PEHU. *Arch. de Med. d. Enf.*, 1910, xiii, 507.

After discussing the various theories and discarding them one after another, Weill and Pehu take up in detail the pathological description of three cases of hypertrophic pyloric stenosis in infants. They come to the conclusion that the muscular hypertrophy presents the character of an inflammation, since it includes connective tissue and a certain amount of round cell infiltration.

They point to such things as the occasional report of perigastric adhesions in these cases as support to their views. As to whether the inflammation occurs in utero or after birth they are unable to conclude.

C. G. GRULEE.

**Technique of the Förster Operation for the Relief of Spastic Paralysis** (Die Technik der Förster-schen Operation). PROF. ALEXANDER TIETZE. *Mitt. aus den Grenz. d. Med. u. Chir.*, bd. 20, heft 3.

The technique of the operation is not very different from an ordinary laminectomy. Above all must the skin of the back be cared for in a most painstaking manner, and it is necessary to begin this preparation many days before the operation, using baths, alcohol, powder, etc.

The continuity of the skin must not be broken and special care should be taken during and after bowel movement.

The bowels should be freely moved two days before the operation and opium given afterward.

If fissures or papillomata exist about the arms a piece of Mosetig-cambric should be stitched to the skin, this being done at the beginning of the operation, thus separating the operative field from the infected one.

Light ether narcosis with oxygen is recommended. A sufficiently long incision is made down upon the spinous processes. Incisions are now made on either side of the processes the full length of the wound.

The arches are now exposed with a broad periosteotome clear to the articular processes, the wound is now tightly compressed for some minutes.

A landmark is now made by driving a small nail into the arch of the fifth lumbar vertebra at the level of the spinous process, as the first sacral root leaves the dural canal at this point.

The arches with the spinous processes are now widely removed, also the ligamentum flavum with the plexus of veins. The dura now lies free in bottom of wound.

At this point the patients frequently suffer from shock and one can judge whether it be best to make a second operation or to continue. If a second operation some days later is chosen the wound is lightly packed and the skin tightly closed by suture, the skin being freely covered with zinc powder.

The second operation is free from blood. The dura is opened in the median line, its edges being caught up with the finest silk and retracted. Care must be taken that the cauda is not injured by the incision.

The first sacral root is now caught up on a blunt hook and retracted gently. This will show the line between the anterior and posterior roots. These are now separated and the posterior one resected as widely as possible. In the cervical region the roots are more brush-like and great care must be taken not to injure the anterior root.

The roots to be resected should be designated by the neurologist. The dura is closed tightly with sutures of finest silk. Muscle and skin suture follow with drainage and the patient is put upon a plaster-of-Paris bed which has previously been prepared and which is to be removed upon the second or third day when the drains are removed.

The dressings must be kept perfectly clean and dry. When the operation is done at one sitting it is advantageous to aspirate the cerebrospinal fluid, allowing the dura to fall flat upon the cord.

The author considers the operation very dangerous but theoretically indicated, and that it promises much for the future of spastic paralysis.

Some brilliant results are reported, but with high mortality in the series. Secondary operations upon the long contracted muscles are at times necessary.

H. A. POTTS.

**The Clinical Results Obtained Up to the Present Time in the Seraphimerlazarett by the Keating-Hart Treatment of Malignant Tumors, or the So-called Fulguration** (Über die im Seraphimerlazarett bisher gewonnennenen klinischen Erfarrungen in Bezug auf die Keating-Hart'sche Behandlung maligner Tumoren oder die sog. Fulguration). JOHN BERG. *Nord. Med. Arkiv.*, 1909, afd. 1, hft. 3, Nr. 4.

The report comprises work on 32 cases of carcinoma, and the writer sums up his opinions in the following way:

1. Fulguration may bring about a temporary protection against extension of the tumor and that even in cases which have passed beyond any possible help from other means.

2. This influence is brought about by the increase of connective tissue but not by destruction of the tumor cells. The number of recurrences in loco as also the number of advancing metastases is very great.

3. The dangers are: (1) Infection. (2) Extension of the carcinoma: (a) By inoculation. (b) By the primary changes produced by the fulguration in the neighborhood of the carcinoma. (c) By the connective tissue surface forcing metastases into the deeper parts. (d) Through the following of the paths of infection.

4. Fulguration is, therefore, very unsatisfactory in its action and in a large number of cases may be regarded as dangerous. It should not be used, therefore, until more strict indications are present.

According to Berg the indications for fulguration in carcinoma may be given as follows: "In such cases where there is present a basis for the fear that the extirpation of the carcinoma as extensively as possible is not in a position to remove this sufficiently the open wound should be treated with the X-ray, and after this fulguration may be used." C. G. GRULEE.

**Report of 600 Lumbar Anæsthesias** (Bericht über 600 lumbar Anæsthesien). DR. MEISSNER. *Beiträge zur Klinischen Chirurgie*, bd. lxiv.

Meissner reports 600 cases of lumbar anæsthesia from Von Brun's clinic. The age limit of this observer varies from that of many others in that he decries the use of lumbar anæsthesia in persons under 17 years. On the other hand, old people he found to take it very well. Injection was made between the third and fourth or the second and third lumbar spines.

Tropococain and novocain were used, the former in 40 cases, the latter in the remaining cases. Novocain was experimented with in varying doses, from 5 per cent to 1 per cent. The 5 per cent solution was used in varying amounts from 1½ to 3 cc.

The elevation of the pelvis, usually practiced in lumbar anæsthesia, was given up by this observer after trial, it being found that it gave no appreciable improvement of the anæsthesia, and collapse after the anæsthesia was very much less frequent when the hips were not elevated.

In almost all cases an elevation of temperature was noted after anæsthesia, irrespective of the wound condition. Occasional rapidly disappearing paræsthesias and girdle sensations were noted. In 6 cases failure of power to urinate was noted, lasting 3 to 4 days.

CONCLUSIONS

1. The employment of novocain of the manufacture of the Hochst Farbwerke, which is put up in ampullæ, gave the greatest satisfaction.

2. The use of small doses of this preparation and the avoidance of elevation of the pelvis gave very good results from the region below the navel and enabled the observers to avoid unpleasant and dangerous after effects.

3. Lumbar anæsthesia has shown itself to be, in the hands of those sufficiently experienced, a useful method of anæsthesia, but by no means without danger.

It is also noted that in military surgery in time of war the difficulty of obtaining absolute asepsis in the field militates against its use, the injections having to be done under conditions of most rigid asepsis.

W. C. DANFORTH.

**Splenectomy in Relation to Union in Fractures.** ALLEN B. KANAVEL. *Bulletin of Northwestern University Medical School*, vol. xii, No. 1.

This treatise covers an experimental study as to the advisability of removing a ruptured spleen when the injury is associated with a fracture of one or more bones

The following conclusions are to be drawn from the long series of experiments made, each of which was followed by a most careful and rigid microscopical examination of the specimens.

The removal of the spleen when it is ruptured interferes slightly with the repair of any fracture but not sufficiently to contraindicate its removal if the exigencies of the case demand it. On the other hand if it can be sutured with safety to the patient it should be done.

Splenectomy results in impairing the regenerative, power of bone in varying degrees in various elements, having in general a more marked effect on the medulla, but in individual cases this apparently may be but slightly affected while the other elements may be more seriously affected. In other words, the effect is probably the result of the general change in the system, rather than any specific effect upon the bone.

ARTHUR B. EUSTACE.

**The Treatment of Fractures by Parathyroid Medication** (Le traitement des fractures par la médication parathyroïdienne). LOUIS HORREL. *Archives générales de Chirurgie*, March 25, 1910.

A few years ago the attention of surgeons was called to a new method of treating fractures by thyroid medication. Gauthier in a number of articles related the results he had obtained and advised the systematic use of thyroid extract in fractures in which consolidation was delayed and in pseudoarthroses.

The results of this treatment were variable. There were positive successes and positive failures. A few accidents due to excessive thyroid gland medication curbed the enthusiasm existing for the method. Little by little the method fell into disuse. We believe

we have found the cause of this inconstancy of results. We believe that to the parathyroids must be attributed a part, if not all of the osteogenetic rôle formerly thought to belong to the thyroid gland, and this leads us to recommend the employment of parathyroid medication in the treatment of fractures.

Parhon, Urechie, MacCallum, Voegthis and others have shown the important influence of the parathyroids in metabolism of metals present in the human organism: calcium, magnesium, sodium, potassium, etc. In individuals who after parathyroidectomy have developed tetany and died therefrom, a marked decrease in the amount of calcium contained in the brain, as well as an increase in the amount of calcium and magnesium present in the urine and feces, has been noted. Frouin has kept living indefinitely thyroparathyroidectomized dogs by adding to their food calcium and magnesium salts. In parathyroidectomized animals, dental disturbances have been noted.

In his experiments, the author employed the parathyroid medication as follows: At times he gave to the animals experimented on fresh parathyroid glands of beef; at times he employed various parathyroid extracts, at time he prepared the extracts himself, following in all its details, the technique of Berkeley and Beebe.

From his experiments he concludes that parathyroidectomy in animals has a very marked restoring influence upon the repair of fractures. He concludes that the parathyroids play an important part in osteogenesis. Their action is equally marked in promoting the growth of healthy bone and in favoring the cicatrization of fractured bone. The action marked in young organisms appears to be nil in adults. All or nearly all the osteogenetic properties formerly attributed to the thyroids is due to the parathyroids. It would be interesting if further experiments were made to determine upon man the extent to which parathyroid medication can accelerate the repair of fractures.

AIMÉ PAUL HEINECK.

**The Origin of Wandering Cartilages in the Knee Joint** (Ein Beitrag zur Entstehung der Gelenkmäuse im Kniegelenk). DR. M. KIRSCHNER. *Beiträge zur Klinischen Chirurgie*, bd. lxiv.

Kirschner enters into a lengthy consideration of the causation of wandering cartilages. He reports three cases in which the typical locking of the joint was present, although the cartilage was still fastened to its place of origin by a firm band.

As to pathogenesis the writer notes two processes:

1. Regression processes: Destruction of the cartilage by an actively ingrowing connective tissue and the degeneration of the bone.

2. Progressive processes: Production of zones of cartilage growth and the increase of connective tissue. Kirschner's conclusions are as follows:

1. The production of free cartilage in the knee joint, without any trauma of a sufficient degree that a history may be obtained of it, seems to occur by choice in a typical locality in the joint. This locality is on the outer side of the internal condyle of the femur, in the fossa intercondyloidea, in front of and close to the attachment of the posterior crucial ligament.

2. Besides the mechanical action of the posterior crucial ligament, which acts as a causative factor in these cases, is still another factor of etiologic importance, which is up to now unknown.

3. It has up to the present not been shown whether this accessory etiologic factor is an osteochondritis desiccans (König) or an ænemic infarct (Ludloff).

4. In operative procedures upon cases of cartilages which are not entirely free, but which are operated in the stage of separation from the place of origin, a portion of the bed from which the cartilage is being given off should also be removed for microscopic examination, in order to further the acquisition of knowledge as to the character of the pathologic process which is responsible for the condition. W. C. DANFORTH.

**Graves' Disease.** JAMES E. MUMFORD. *Boston Medical and Surgical Journal*, June 21, 1910.

The author states that Graves' disease is really hyperthyroidism and the symptoms are dependent upon the activity of the secretion and its absorption. A typical and striking feature is the blood picture, which shows erythrocytes slightly increased, leucocytes — total count low, polymorphonuclears especially, relative lymphocytosis.

He believes that Graves' disease must be actively treated, and a large percentage of cases is curable.

He arrives at the following conclusions: Graves' disease is due to abnormal thyroid activity, in advanced cases degenerative gland changes may lead to signs of myxœdema; histology indicates shifting symptoms; enlarged thymus is a common post-mortem finding; classical symptoms may be lacking, even in advanced cases; if taken early, prognosis is good; sera cure a goodly percentage; neutral hydrobromate of quinine is very efficient; partial thyroidectomy cures 70 per cent. This is the surest method.

GORDON T. COURTENAY.

**Surgical Treatment of Certain Cases of Glycosuria.** A. W. MAYO ROBSON. *British Medical Journal*, April 23, 1910.

Mr. Robson says that the early recognition and treatment of interstitial pancreatitis, or of pancreatic catarrh, by drainage of the bile ducts, and thus indirectly of the pancreatic ducts, and the removal of the cause whether that be gall-stones, duodenal ulcer, or other conditions may be the means of averting diabetes.

In certain diseases of the pancreas, even after the appearance of glycosuria, surgical treatment is well worth considering, as in a number of cases it has led to complete disappearance of sugar from the urine, and in others to an arrest of the disease causing the glycosuria.

Every case of diabetes should be considered from its etiological point of view, seeing that certain cases of glycosuria of pancreatic origin are curable, and in others the progress of the disease may be arrested by suitable surgical methods that can be carried out with very small risk. ARTHUR B. EUSTACE.

# BOOK REVIEWS

ABHANDLUNGEN AUS DEM GEBIETE DER GEBURTSHILFE UND GYNÆKOLOGIE. Mitteilungen aus der zweiten Frauenklinik der königl. und Universität zu Budapest. Herausgegeben von Prof. Dr. W. Tauffer, Direktor der Klinik. Band 1, heft 2. Berlin: S. Karger, 1909.

The second part of this new addition to German obstetrical and gynecological literature comprises four papers. The first of these, entitled "Über die Hebostectomie," by Professor Stephan V. Toth, is the report of ten cases where the extramedian enlargement of the pelvis was accomplished with no maternal mortality. The conclusion is that this operation is not one suited for general practice but must be confined to the hospital.

The next article, by Kubinyi, is on the technique of abdominal hysterectomy. The subject is discussed from all points of view, consideration being given to adhesions, to adnexal complications both of an inflammatory or neoplastic nature, to unilateral and bilateral adnexal involvement, and to various conditions of the uterus from metritis to tumors. According to the nature of the complication, Kubinyi details the exact method of extirpation, comparing the procedures employed in Tauffer's clinic with those extensively used elsewhere. His conclusions are formulated very clearly.

Injuries to the ureter sustained during laparotomy with special reference to the treatment of such injuries is Scipiades' contribution to this collection. Accidental ureteral wounds occurred in ten cases out of a series of 2,210 laparotomies since September, 1881, in the Budapest clinic. In every case these were sustained in the atypical operations, where technical difficulties were extreme. Seven of these were cases of intraligamentous cysts, two of intraligamentous fibroids, and one of suppurative adnexal masses.

The injury was but slight in one case, incomplete in two others, complete in the remaining seven, so considerable in three that the peripheral stump could not be found. Scipiades then discusses the various methods of repair, describes the Tauffer end-to-end anastomosis, closing with a discussion of the question of nephrectomy as a terminal necessity.

Lastly in this number comes an article by Frigyesi on the use of scopolamin morphin in labor. The writer discusses the literature, in part, on this subject, and formulates the contraindications to the use of the alkaloids. They were employed in two hundred cases.

Frigyesi's conclusions reveal nothing new concerning this now well tried method, and he is inclined to agree with Gauss in general. CAREY CULBERTSON.

ELEMENTS D'OBSTETRIQUE. By V. Wallich. Second edition. Paris: G. Steinheil, 1910

In this second edition, the author brought his subject matter up to date without increasing in size his volume. This is always an advantage in the production of a textbook in minature, which Wallich's work is. Merely the elements, or essentials, of the subject are given, many of the illustrations are new, and the present volume, in its publication is a decided improvement upon the first edition, produced in 1907.

CAREY CULBERTSON.

TRATAMENTO DE LOS QUISTES HEDATICOS. By Daniel J. Cranwell and M. Herrera Vegas, Buenos Aires, 1910.

This is a monograph of 162 pages based on a personal experience with 414 cases. After classification of their cases the writers take up the subject under the headings of (1) punctures, (2) opening and drainage, (3) exceptional operations, (4) prophylaxis against postoperative recurrence, and (5) the indications for operation. The dangers incident to each form of treatment are fully discussed and the literature (especially French and Spanish) exhaustively quoted. On the whole, if one wishes to become familiar with the subject, a perusal of this work is well worth the time.

C. G. GRULEE.

## BOOKS RECEIVED

GYNECOLOGICAL DIAGNOSIS. By Walter L. Burrage, A. M., M. D. New York and London: D. Appleton & Company, 1910.

HOOKWORM DISEASE. By George Dock, A. M., M. D., and Charles C. Bass, M. D. St. Louis: C. V. Mosby Company, 1910.

NEPHROCOLOPTOSIS. By H. W. Longyear, M. D. St. Louis: C. V. Mosby Company, 1910.

GYNECOLOGY. The Practical Medicine Series, Volume IV. Edited by E. C. Dudley, A. M., M. D., and C. von Bachellé, M. S., M. D. Chicago: Year Book Publishers, 1910.